OCT 19 2011

LES-11-00142-NRC

Attn: Document Control Desk
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Louisiana Energy Services, LLC
NRC Docket No. 70-3103

Subject: Interim License Basis Documents Update

In accordance with 10 CFR 70.72(c) and 10 CFR 70.32, Louisiana Energy Services, LLC (LES) is allowed to make changes to Licensing Basis Documents (LBDs) under LES' approval authority. This Interim update, which entails changes to the ISA Summary and the Safety Analysis Report, is being provided to support the Autoclave local worker event as a non-credible event.

Attached as Enclosures 1 and 2 are marked up pages to the respective LBDs. Revision bars, strikethroughs and underlines were utilized to show the changes. Attached as Enclosures 3 and 4 are complete clean copies of the respective LBDs. A description of each change is provided in the revision history.

The enclosures 2 and 4 contain security-related information and disclosure to unauthorized individuals could present security vulnerabilities. Therefore, LES requests that these enclosures be withheld from public disclosure in accordance with 10 CFR 2.390.

If you have any questions concerning this submittal, please contact Zackary Rad, LES Licensing Manager, at 575.394.3689.

Respectfully,

David E. Sexton
Chief Nuclear Officer and Vice President of Operations

Enclosures:
1) Page changes to the Safety Analysis Report
2) Page changes to the Integrated Safety Analysis Summary
3) Clean copy of Safety Analysis Report, Revision 31
4) Clean copy of Integrated Safety Analysis Summary, Revision 20

NMSS01

LES, PO Box 1789, Eunice, New Mexico 88231, USA T: +1 575 394 4646 F: +1 575 394 4545 W: www.urenco.com/LES

cc:

Greg Chapman, Project Manager
Two White Flint
Mail Stop EBB2-C40M
11545 Rockville Pike
Rockville, MD 20852-2738

Joe Calle
Chief, Fuel Facility Branch 2
US NRC, Region II
245 Peachtree Center Ave, NE
Suite 1200
Atlanta, GA 30303-1257

Deborah A. Seymour
Chief, Construction Projects Branch 1
US NRC, Region II
245 Peachtree Center Ave, NE
Suite 1200
Atlanta, GA 30303-1257
tlanta, GA 30303-1257

Enclosure 1
Page changes to the Safety Analysis Report
(Revision bars, strikethroughs and underlines utilized)

The product streams leaving the cascades are brought together into one common manifold from the Cascade Hall. The product stream is transported via a train of vacuum pumps to Product LTTS in the UF_6 Handling Area. There are five Product LTTS per Cascade Hall.

The Product Take-off System also contains a system to purge light gases (typically air and HF) from the enrichment process. This system consists of UF_6 Cold Traps which capture UF_6 while leaving the light gas in a gaseous state. The cold trap is followed by product vent Vacuum Pump/Trap Sets, each consisting of a carbon trap, an alumina trap, and a vacuum pump. The carbon trap removes small traces of UF_6 and the alumina trap removes any HF from the product gas.

Tails Take-off System

(See 12.2.2.4) The primary function of the Tails Take-off System is to provide continuous withdrawal of the gaseous UF_6 tails from the cascades. A secondary function of this system is to provide a means for removal of UF_6 from the centrifuge cascades under abnormal conditions.

The tails stream exits each Cascade Hall via a primary header, goes through a pumping train, and then to Tails LTTS in the UF_6 Handling Area. There are eight Tails LTTS per Cascade Hall. In addition to the four primary systems listed above, there are two major support systems:

Product Blending System

(See 12.2.2.5) The primary function of the Product Blending System is to provide a means to fill 30B cylinders with UF_6 at a specific enrichment of ^{235}U to meet customer requirements. This is accomplished by blending (mixing) UF_6 at two different enrichment levels to one specific enrichment level. The system can also be used to transfer product from a 30B cylinder to another 30B cylinder without blending.

This system consists of Blending Donor Stations (which are similar to the Solid Feed Stations) and Blending Receiver Stations (which are similar to the Product LTTS) described under the primary systems.

Product Liquid Sampling System

(See 12.2.2.6) The function of the Product Liquid Sampling System is to obtain an assay sample from filled product 30B cylinders. The sample is used to validate the exact enrichment level of UF_6 in the filled product cylinders before the cylinders are sent to the fuel processor.

The Product Liquid Sampling System is one of two systems at NEF that changes solid UF_6 to liquid UF_6. The Sub-Sampling System also changes solid UF_6 to liquid UF_6.

1.1.4 Raw Materials, By-Products, Wastes, And Finished Products

The facility handles Special Nuclear Material of ^{235}U contained in uranium enriched above natural but less than or equal to the LES license limit~~5.0 w/o~~ in ~~the~~ ^{235}U isotope. The ^{235}U is in the form of uranium hexafluoride (UF_6). The facility processes approximately 690 feed cylinders (Model 48Y), 350 product cylinders (Model 30B), and 625 UBCs (Model 48Y) per year. LBDCR-11-0030

LES does not propose possession of any reflectors or moderators with special characteristics.

- Table 1.1-4, Estimated Annual Non-Radiological Wastes

Radioactive concentration limits and handling for liquid wastes and effluents are detailed in the Environmental Report.

The waste and effluent estimates described in the tables listed above were developed specifically for the NEF. Each system was analyzed to determine the wastes and effluents generated during operation. These values were analyzed and a waste disposal path was developed for each. LES considered the facility site, facility operation, applicable Urenco experience, applicable regulations, and the existing U.S. waste processing/disposal infrastructure during the development of the paths. The Liquid Effluent Collection and Treatment System and the Solid Waste Collection System were designed to meet these criteria.

Construction Wastes

During construction, efforts are made to minimize the environmental impact. Erosion, sedimentation, dust, smoke, noise, unsightly landscape, and waste disposal are controlled to practical levels and applicable regulatory limits. Wastes generated during site preparation and construction will be varied, depending on the activities in progress. The bulk of the wastes will consist of non-hazardous materials such as packing materials, paper and scrap lumber. These wastes will be transported off site to an approved landfill. It is estimated that the NEF will generate a non-compacted average waste volume of 3,058 m^3 (4,000 yd^3) annually.

Hazardous type wastes that may be generated during construction have been identified and annual quantities estimated are shown in Table 1.1-5, Annual Hazardous Construction Wastes. Any of these wastes that are generated will be handled by approved methods and shipped off site to approved disposal sites.

Management and disposal of all wastes from the NEF site will be performed by personnel trained to properly identify, store, and ship wastes, audit vendors, direct and conduct spill cleanup, provide interface with state agencies, maintain inventories and provide annual reports.

NEF is exempt from requiring a~~A~~ Spill Prevention, Control and Countermeasure Plan (SPCC). However, BMPs will be implemented during construction to minimize the possibility of spills of hazardous substances, minimize environmental impact of any spills and ensure prompt and appropriate remediation. In the event of a release, ~~The SPCC plan~~site procedures will identify ~~sources, locations and quantities of potential spills and response measures. The plan will identify~~ individuals and their responsibilities for ~~implementation of the plan and provide for~~ prompt notifications of state and local authorities. The site procedures will also identify the individuals who may determine and initiate corrective actions, if warranted.

LBDCR-11-0025

LBDCR-11-0025

1.2 Institutional Information

This section addresses the details of the applicant's corporate identity and location, applicant's ownership organization and financial information, type, quarterly, and form of licensed material to be used at the facility, and the type(s) of license(s) being applied for.

1.2.1 Corporate Identity

1.2.1.1 Licensee

The Licensee's name, address, and principal office are as follows:

Louisiana Energy Services, L.L.C.
P.O. Box 1789
275 Highway 176
Eunice, NM 88231

1.2.1.2 Organization and Management of Applicant

Louisiana Energy Services (LES), L.L.C. is a Delaware limited liability company. It has been formed solely to provide uranium enrichment services for commercial nuclear power plants. LES has one, 100% owned subsidiary, operating as a limited liability company, formed for the purpose of purchasing Industrial Revenue Bonds and no divisions. The ownership of LES is as follows:

1. Urenco Investments, Inc. (UII) (a Delaware corporation and wholly-owned subsidiary of Urenco Limited, a corporation formed under the laws of the of England ("Urenco") and owned in equal shares by Enrichment Investments Limited ("EIL"), Uranit UK Limited ("Uranit"), both companies formed under English law, and Ultra-Centrifuge Nederland NV ("UCN"), a company formed under Dutch law. EIL is ultimately wholly-owned by the government of the United Kingdom; UCN is ultimately wholly-owned by the government of the Netherlands; Uranit is ultimately owned by Eon Kenkraft GmbH (50%) and RWE Power Ag (50%), companies formed under the laws of the Federal Republic of Germany). ~~United Kingdom ("Urenco") and owned in equal shares by BNFL Enrichment Limited ("BNFL-EL"), Ultra-Centrifuge Nederland NV ("UCN"), and Uranit GmbH ("Uranit") companies formed under English, Dutch and German law, respectively; BNFL-EL is wholly-owned by British Nuclear Fuels plc, which is wholly-owned by the Government of the United Kingdom; UCN is 99% owned by the Government of the Netherlands, with the remaining 1% owned collectively by the Royal Dutch Shell Group, DSM, Koninklijke Philips Electronics N.V. and Stork N.V.; Uranit is owned by Eon Kernkraft GmbH (50%) and RWE Power AG (50%), which are corporations formed under laws of the Federal Republic of Germany).~~ UII holds ~~29.16~~96% (as of December 31, ~~2006~~2010) of the membership units and has 100% of the voting power. ~~It is anticipated that the membership units for UII will increase to more than 50% before the end of 2007 as UII has provided the majority of the funding in 2007.~~ LBDCR-11-0020

2. Urenco Deelnemingen B.V. (a Netherlands corporation and wholly-owned subsidiary of Urenco ~~Investments~~USA Inc. The ownership of Urenco ~~Investments~~ USA Inc. is explicitly described above. Urenco Deelnemingen B.V. holds ~~70.84~~4% of the membership units (as of December 31, ~~2006~~2010) and has 0% of the voting power. ~~It is~~ LBDCR-11-0020

~~anticipated that the membership units for UDE will recede to less than 50% before the end of 2007 as UII has provided the majority of the funding in 2007.~~ LBDCR-11-0020

The President of LES is Gregory OD Smith. The President reports to the Board of Managers. The Board of Managers are:

- Mr. Gregory OD Smith
  President, Chief Executive Officer
  Louisiana Energy Services, LLC
  275 Hwy 176
  Eunice , NM 88231

  Mr. Smith is a citizen of the United States of America LBDCR-11-0020

- Dr. Helmut Engelbrecht
  Chief Executive Officer
  Urenco Limited
  18 Oxford Road
  Marlow Bucks
  SL7 2NL, United Kingdom

  Dr. Engelbrecht is a citizen of the Federal Republic of Germany

- Mr. ~~Bart Le Blanc~~Friso van Oranje LBDCR-11-0020
  Chief Financial Officer
  Urenco Limited
  18 Oxford Road
  Marlow Bucks
  SL7 2NL, United Kingdom

  Mr. ~~Le Blanc~~van Oranje is a citizen of the Netherlands LBDCR-11-0020

- Dr. Charles W. Pryor, Jr.
  Chairman of the Board ~~of Urenco Investments~~
  Urenco ~~Investments~~USA, Inc.
  ~~1560 Wilson Blvd., Suite 300~~1164 Pryor Ridge Trail
  ~~Arlington, VA 22209, 2463~~Lynchburg, VA24503

  Dr. Pryor is a citizen of the United States of America

- Mr. Christopher Chater LBDCR-11-0020
  Board of Managers Member
  Bahnhofstrasse 8
  48455 Bad Bentheim
  Germany

  Mr. Chater is a citizen of the United Kingdom

The Vice President - Operations is the primary regulatory contact and is responsible for the safe operation of the ~~National Enrichment~~URENCO USA Facility. LES' principal location for business is Eunice, New Mexico. The facility will be located in Lea County near Eunice, New Mexico. No other companies will be present or operating on the ~~NEF~~ URENCO USA site other than services specifically contracted by LES. LBDCR-11-0020

Foreign Ownership, Control and Influence (FOCI) of LES is addressed in the ~~NEF~~ URENCO USA Standard Practice Procedures for the Protection of Classified Matter, Appendix 1 – FOCI Package. LBDCR-11-0020 The NRC in their letter dated, March 24, 2003, has stated "…that while the mere presence of foreign ownership would not preclude grant of the application, any foreign relationship must be examined to determine whether it is inimical to the common defense and security [of the United States]". (NRC, 2003) The FOCI Package mentioned above, and amendments thereto, provide~~s~~ sufficient information for this examination to be conducted. LBDCR-11-0020

1.2.1.3 Address of the Enrichment Plant and Legal Site Description

The ~~NEF~~ URENCO USA site is physically located approximately 8 km (5 mi) east of Eunice, New Mexico adjacent to New Mexico Highway 234 in Lea County. The legal description is as follows: LBDCR-11-0020

A PARCEL OF LAND WITHIN SECTION 32, TOWNSHIP 21 SOUTH, RANGE 38 EAST, NEW MEXICO PRINCIPAL MERIDIAN, LEA COUNTY, NEW MEXICO,

BEGINNING at the one-quarter corner between Sections 31 and 32, (a found GLO brass cap on a 2-in iron pipe);

THENCE N00°38'22"W along the section line between Sections 31 and 32 a distance of 2638.37 feet to the corner of Sections 29, 32, 31 and 30, (a found GLO brass cap on a 2-in iron pipe);

THENCE N89°18'08"E along the section line between Sections 29 and 32 a distance of 2640.69 feet to a set 5/8-in rebar with a 2-in aluminum cap marked "MUTH PLS 13239";

THENCE N89°18'08"E along the section line between Sections 29 and 32 a distance of 2640.69 feet to the corner of Sections 28, 33, 32 and 29, (a found GLO brass cap on a 2-in iron pipe);

THENCE S00°39'20"E along the section line between Sections 32 and 33 a distance of 2640.49 feet to the one-quarter corner between Sections 32 and 33, (a found GLO brass cap on a 1-in iron pipe);

THENCE S00°41'56"E along the section line between Sections 32 and 33 a distance of 2324.52 feet to a found railroad iron marking the right-of-way for New Mexico State Highway No. 234; from whence the corner of Sections 33 and 32 of Township 21 South, Range 38 East, and Sections 4 and 5 of Township 22 South, Range 38 East (a found 1/2-in rebar) bears S00°41'56"E a distance of 340.08 ft;

THENCE N80°10'49"W along the observed northerly right-of-way line of New Mexico State Highway No. 234 a distance of 5377.12 ft to a point of intersection with the section line between Sections 31 and 32 (set 5/8-in rebar with a 2-in aluminum cap marked "MUTH PLS 13239"); from whence the corner of Sections 31 and 32 of Township 21 South, Range 38 East, and

Sections 6 and 5 of Township 22 South, Range 38 East (a found GLO brass cap on a 2-in iron pipe) bears S00°35'16"E a distance of 1321.66 ft;

THENCE N00°35'16"W along the section line between Sections 31 and 32 a distance of 1345.14 to the POINT OF BEGINNING

Said Parcel CONTAINS 542.80 ACRES more or less

1.2.2 Financial Information

LES estimates the total cost of the ~~NEF~~ URENCO USA site to be approximately $1.2 billion (in 2002 dollars), excluding escalation, contingency, interest, tails disposition, decommissioning, and any replacement equipment required during the life of the facility. LBDCR-11-0020

There are financial qualifications to be met before a license can be issued. LES acknowledges the use of the following Commission-approved criteria as described in Policy Issues Associated with the Licensing of a Uranium Facility; Issue 3, Financial Qualifications (LES, 2002) in determining if the project is financially feasible:

1. Construction of the facility shall not commence before funding (except decommissioning funding, and liability insurance as discussed below) is fully committed. Of this full funding (equity and debt), the applicant must have in place before constructing the associated capacity: (a) a minimum of equity contributions of 30% of project costs from the parents; and (b) firm commitments ensuring funds for the remaining project costs.
2. LES shall not proceed with the project unless it has in place long-term enrichment contracts (i.e., five years) with prices sufficient to cover both construction and operation costs, including a return on investment, for the entire term of the contracts.
3. In accordance with the approved Exemption from certain provisions of 10 CFR 40.36 as discussed in Section 1.2.5 of this SAR, decommissioning funding will be provided incrementally. Therefore, receipt of UF_6 into a building shall not commence before the final executed copies of the reviewed financial assurance instruments for that building are provided to the NRC.

LES shall in accordance with 10 CFR 140.13b, (CFR, 2003l), prior to and throughout operation, have and maintain nuclear liability insurance in the type and amounts the Commission considers appropriate up to a limit of $300 million to cover liability claims arising out of any occurrence within the United States, causing, within or outside the United States, bodily injury, sickness, disease, or death, or loss of or damage to property, or loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of chemical compounds containing source or special nuclear material.

The amounts of nuclear energy liability insurance required may be furnished and maintained in the form of:

1. An effective facility form (non-indemnified facility) policy of nuclear energy liability insurance from American Nuclear Insurers and/or Mutual Atomic Energy Liability underwriters; or
2. Such other type of nuclear energy liability insurance as the Commission may approve; or

produced a maximum epicentral intensity of VIII on the Modified Mercalli Intensity (MMI) Scale. The intensity observed at the NEF site is IV on the MMI scale.

A site-specific probabilistic seismic hazard analysis was performed for the NEF site using the seismic source zone geometries and earthquake recurrence models. The modeling included attenuation models suited for the regional and local seismic wave transmission characteristics.

Total seismic ground motion hazard to a site results from summation of ground motion effects from all distant and local seismically active areas. The 250-year and 475-year return period peak horizontal ground accelerations are estimated at 0.024 g and 0.036 g, respectively. The 10,000 year return period peak horizontal ground acceleration is estimated at 0.15 g. ~~This return period is equivalent to a mean annual probability of E-4.~~ The associated peak vertical ground motion is estimated at 0.10 g. LBDCR-11-014

1.3.5.3 Other Geologic Hazards

There are no other known geologic hazards that would adversely impact the NEF site.

1.5 Chapter 1 Tables

Table 1.1-5 Annual Hazardous Construction Wastes

Waste Type	Annual Quantity
Paint, Solvents, Thinners, Organics	1,134 L (3,000 gal)
Petroleum Products – Oils, Lubricants	1,134 L (3,000 gal)
Sulfuric Acid (Batteries)	380 L (100 gal)
Adhesives, Resins, Sealers, Caulking	910 kg (2,000 lbs)
Lead (Batteries)	91 kg (200 lbs)
Pesticide	380 L (100 gal)

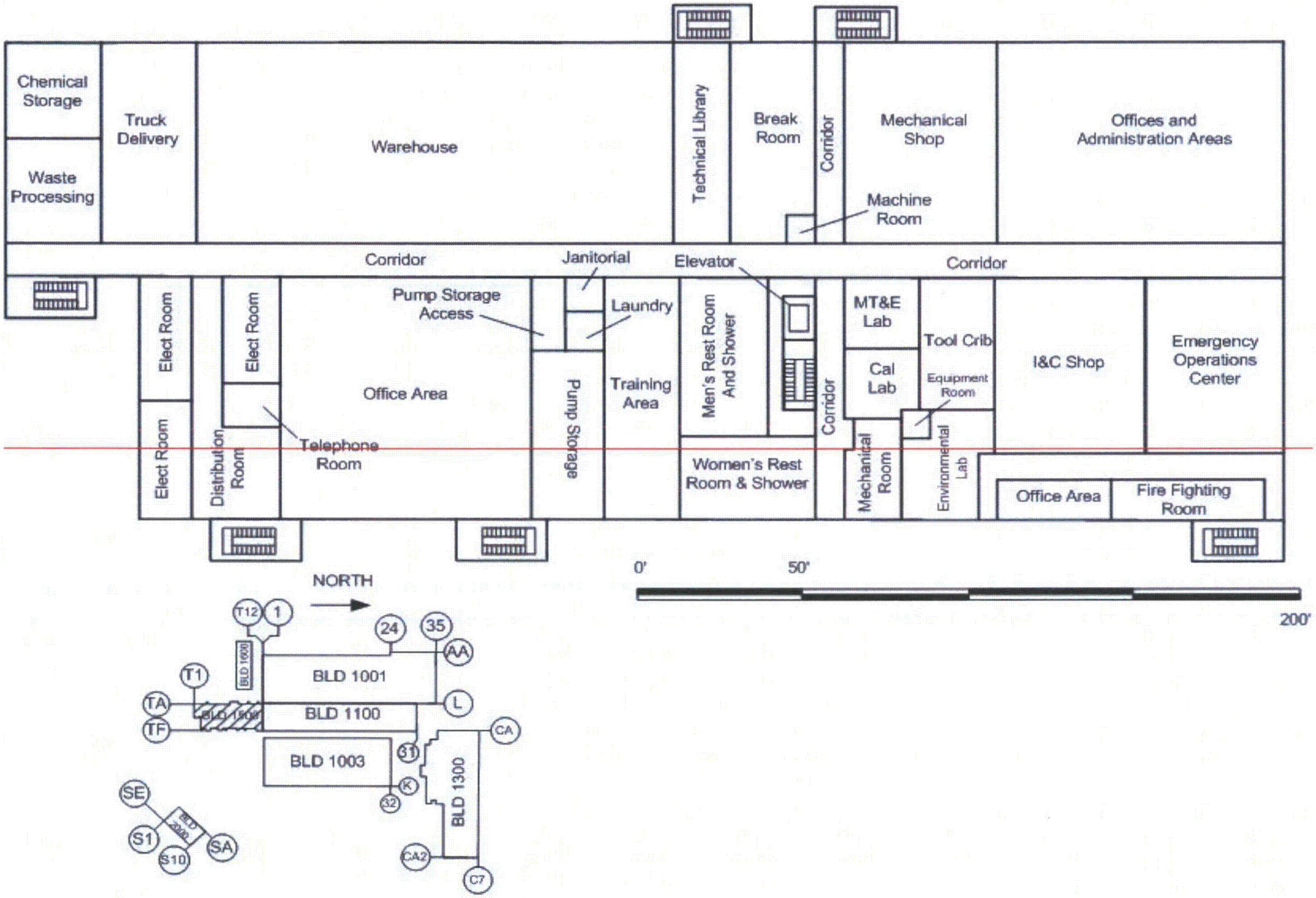
Table 1.2-1 Type, Quantity and Form of Licensed Material

Source and/or Special Nuclear Material	Physical and Chemical Form	Maximum Amount to be Possessed at Any One Time
Uranium (natural and depleted) and daughter products	Physical: Solid, Liquid and Gas Chemical: UF_6, UF_4, UO_2F_2, oxides and other compounds	~~136,120,000 kg~~See Material License Condition 8A for limit.
Uranium enriched in isotope ^{235}U up to the LES license limit (See Material License Condition 6B for limit)~~5% by weight and uranium daughter products~~	Physical: Solid, Liquid, and Gas Chemical: UF_6, UF_4, UO_2F_2, oxides and other compounds	~~545,000 kg~~See Material License Condition 8B for limit.
^{99}Tc, transuranic isotopes and other contamination	Any	Amount that exists as contamination as a consequence of the historical feed of recycled uranium at other facilities(1)

LBDCR-11-0030

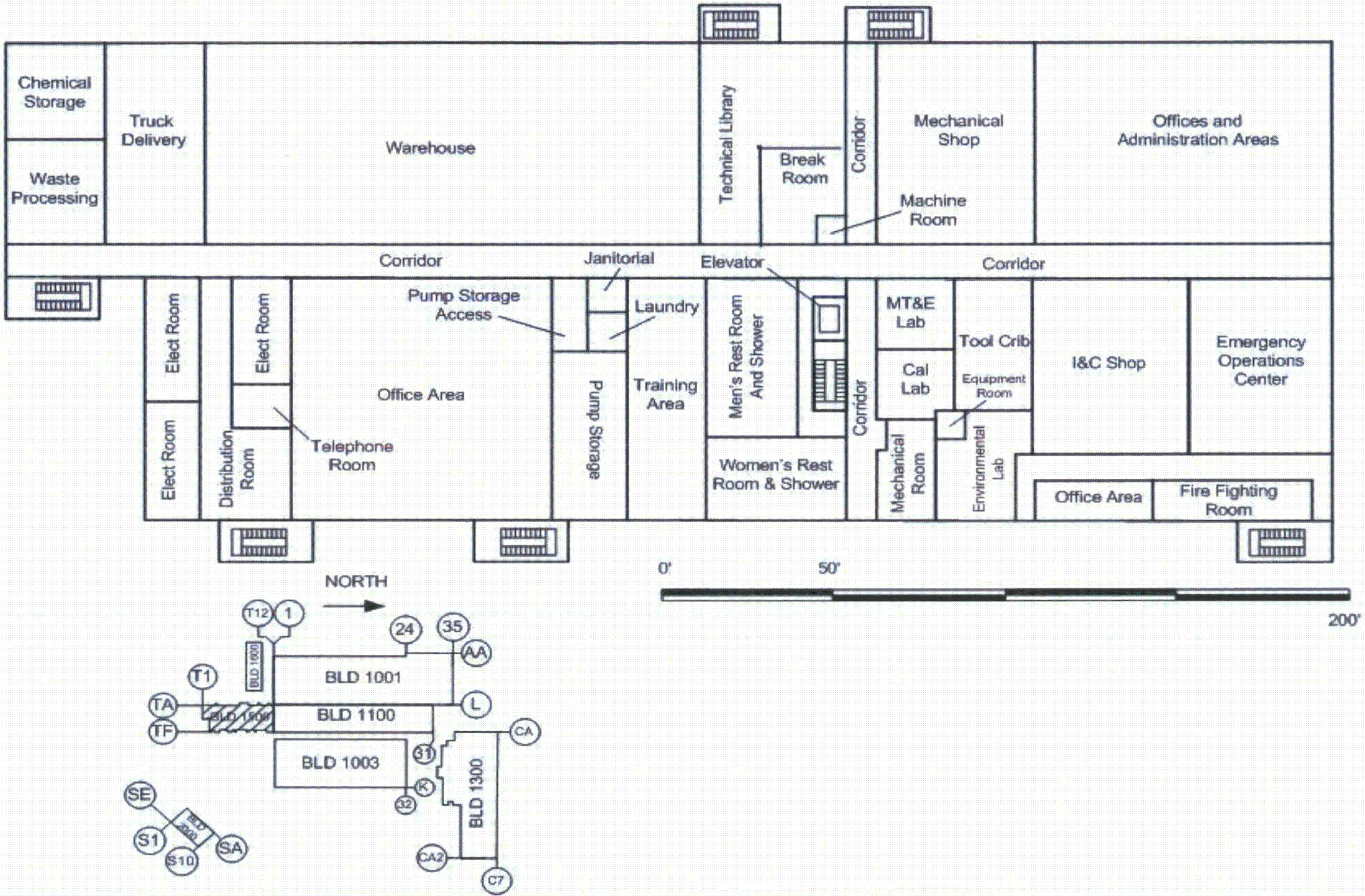
(1) To minimize potential sources of contamination of UF_6, such as ^{99}Tc, LES will require UF_6 suppliers to provide Commercial Natural UF_6 in accordance with ASTM C 787, "Standard Specification for Uranium Hexafluoride for Enrichment." In addition, cylinder suppliers will be required to preclude use of cylinders that, in the past, have contained reprocessed UF_6, unless they have been decontaminated. Periodic audits of suppliers will be performed to provide assurance that these requirements are satisfied.

1.6 Chapter 1 Figures



LBDCR-
11-0016

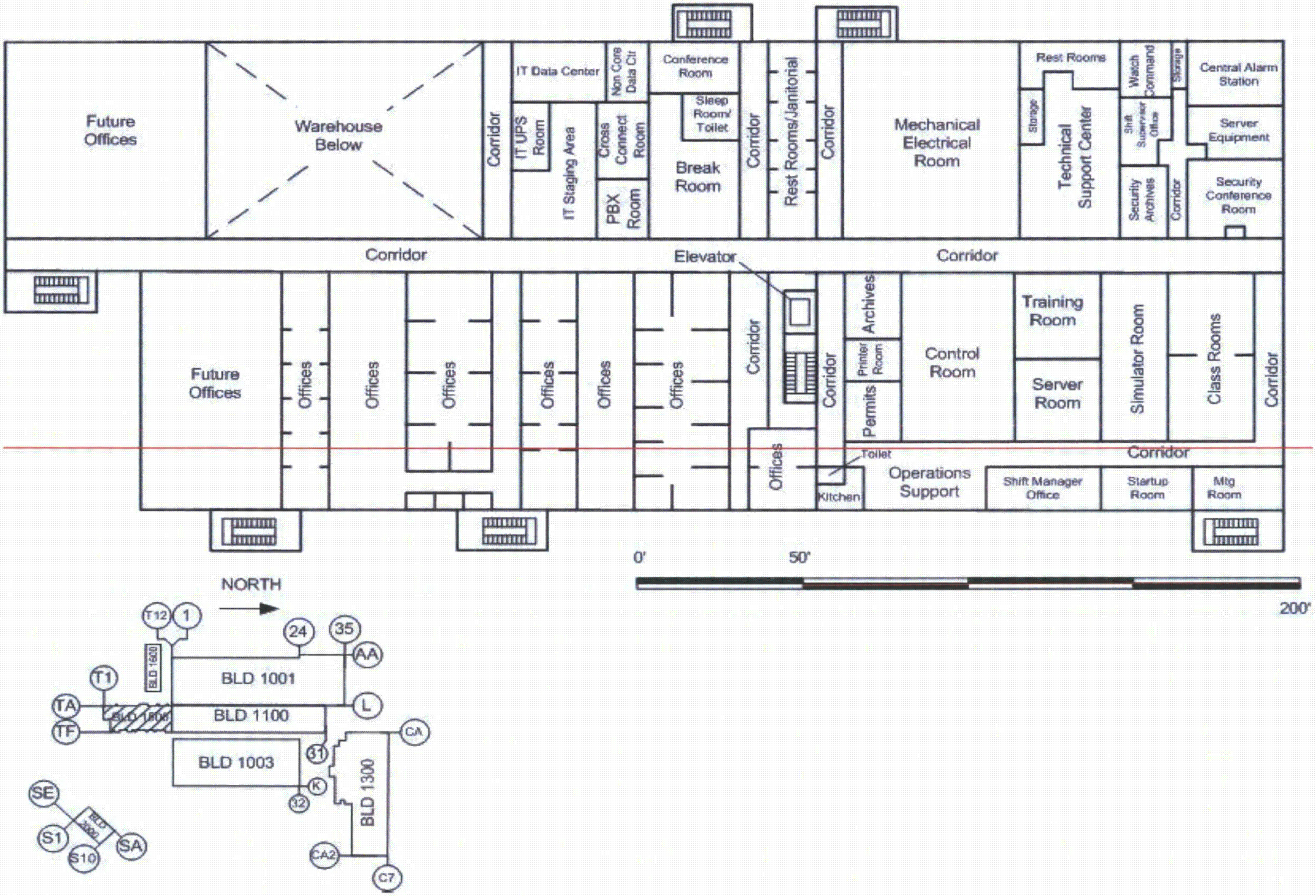
1.6 Chapter 1 Figures



LBDCR-11-0016

Figure 1.1-13 Technical Services Building First Floor

1.6 Chapter 1 Figures



LBDCR-11-0016

1.6 Chapter 1 Figures

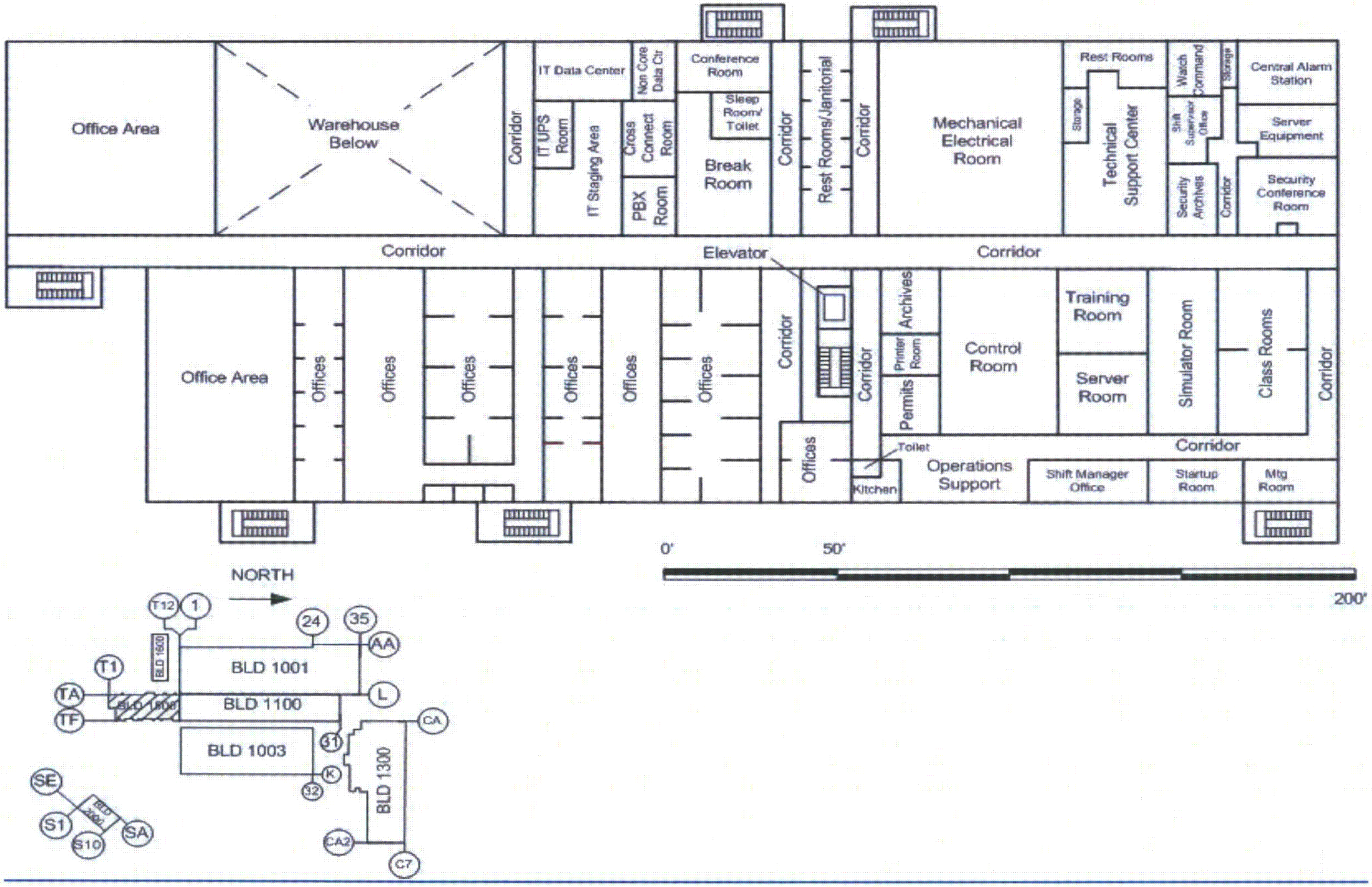


Figure 1.1-14 Technical Services Building Second Floor

LBDCR-11-0016

2.1 Organizational Structure

The LES organizational structure is described in the following sections. The organizational structure indicates the lines of communication and management control of activities associated with the design, construction, operation, and decommissioning of the facility.

2.1.1 Corporate Functions, Responsibilities, and Authorities

LES is a registered limited liability company formed solely to provide uranium enrichment services for commercial nuclear power plants. The LES company organization and management structure is described in Chapter 1, Section 1.2, Institutional Information.

Lea County, New Mexico has accepted the LES proposal to develop the NEF. Lea County has issued its Industrial Revenue Bond (National Enrichment Facility Project) Series 2004 in the maximum aggregate principal amount of $400,000,000 to accomplish the acquisition, construction and installation of the project pursuant to the County Industrial Revenue Bond Act, Chapter 4, Article 59 NMSA 1978 Compilation, as amended. The Project is comprised of the land, buildings, and equipment.

Under the Act, Lea County is authorized to acquire industrial revenue projects to be located within Lea County but outside the boundaries of any incorporated municipality for the purpose of promoting industry and trade by inducing manufacturing, industrial and commercial enterprises to locate or expand in the State of New Mexico, and for promoting a sound and proper balance in the State of New Mexico between agriculture, commerce, and industry. Lea County will lease the project to LES, and LES will be responsible for the construction and operation of the facility. Upon expiration of the Bond after 30 years, LES will purchase the project.

The County has no power under the Act to operate the project as a business or otherwise or to use or acquire the project property for any purpose, except as lessor thereof under the terms of the lease.

In the exercise of any remedies provided in the lease, the County shall not take any action at law or in equity that could result in the Issuer obtaining possession of the project property or operating the project as a business or otherwise.

LES is responsible for the design, quality assurance, construction, operation, and decommissioning of the enrichment facility. The President of LES reports to the LES Board of Managers as described in Section 1.2.

The President receives policy direction from the LES Board of Managers. Reporting to the President is the Vice President - Operations & Chief Nuclear Officer, the Vice President - Project, Vice President - ~~Compliance~~ Regulatory Affairs and General Counsel, and Chief Financial Officer. The Quality Assurance Manager reports to the ~~Vice President~~Director of Compliance~~/General Counsel~~ for functional day to day activities and has a direct line of communication to the Vice President – Operations & Chief Nuclear Officer and President for stop work authority. The Health Safety & Environmental Manager reports to the ~~Vice President~~Director of Compliance~~/General Counsel~~. The HS&E Manager has a direct line of communication to the Vice President - Operations & Chief Nuclear Officer for all matters concerning safety during operations~~,~~ and ~~design and construction~~. Figure 2.1-2, LES National Enrichment Facility Operating Organization shows the authority and lines of communication.

LBDCR-11-0031

LBDCR-11-0031

LBDCR-11-0031

the discharge of these responsibilities, the Plant Manager directs the activities of the following groups:

- Security
- Operations
- Technical Services
- Plant Support
- ~~Training & Support Services~~
- Compliance

LBDCR-11-0031

The responsibilities, authorities and lines of communication of key management positions within the operating organization are discussed in Section 2.2, Key Management Positions.

Position descriptions for key management personnel in the operating organization will be accessible to all affected personnel and to the NRC.

2.1.4 Transition From Project to Operations

LES is responsible for the design, quality assurance, construction, testing, initial startup, operation, and decommissioning of the facility.

The National Enrichment Facility (NEF) has commenced operation with the first cascade (Cascade 101) being commissioned and placed into service. Construction activities will continue as each subsequent cascade is commissioned and placed into service. Due to the process system modular design, each cascade can be isolated from one another. This allows the construction, commissioning and operation of new cascades as well as the removal and replacement of existing centrifuges/cascades to continue while the remaining cascades are in operation. This modular design approach also supports the addition of subsequent Separations Building Modules (SBM) and extension modules with cascades in operation.

The focus of the organization has shifted from the project to construction turnover, initial start-up and operation of each facility system and subsequent cascades. LES has provided for staffing of the LES NEF Operating Organization to ensure smooth transition from construction activities to operation activities. The Health, Safety, and Environmental Manager and ~~Plant Support Director~~Director of Compliance have the authority to report safety concerns directly to the Vice President - Operations & Chief Nuclear Officer (as shown in Figure 2.1-2) for HS&E matters related to operations, design or construction. These positions are intentionally provided stop work authority at the Vice President - Operations & Chief Nuclear Officer level to provide significant continued focus on the health, safety, and environment goals during design, construction, and operations. URENCO, which has been operating gas centrifuge enrichment facilities in Europe for over 30 years, will have personnel integrated into the LES organization to provide technical support during startup of the facility and transition into the operations phase.

LBDCR-11-0031

2.2 Key Management Positions

This section describes the functional positions responsible for managing the operation of the facility. The facility is staffed at sufficient levels prior to operation to allow for training, procedure development, and other pre-operational activities.

The responsibilities, authorities and lines of communication for each key management position are provided in this section. Responsible managers have the authority to delegate tasks to other individuals; however, the responsible manager retains the ultimate responsibility and accountability for implementing the applicable requirements. Management responsibilities, supervisory responsibilities, and the criticality safety engineering staff responsibilities related to nuclear criticality safety are in accordance with ANSI/ANS-8.19, Administrative Practices for Nuclear Criticality Safety.

The LES Corporate and Operating Organization and lines of communication are shown in Figure 2.1-2.

2.2.1 Operating Organization

The functions and responsibilities of key facility management are described in the following paragraphs. Additional detailed responsibilities related to nuclear criticality safety for key management positions and remaining supervisory and criticality safety staff are in accordance with ANSI/ANS-8.19. Some position titles have been changed to better reflect the actual responsibilities of the position. Similarly, some operating functions have been assigned to different managers to better reflect the operating organization presently used at Urenco and U. S. nuclear facilities.

A. Vice President – Operations & Chief Nuclear Officer

The Vice President – Operations & Chief Nuclear Officer reports to the President and is a critical member of the leadership team for LES, with the ultimate responsibility for the nuclear safety, industrial safety, security, and operations of the facility. The Vice President – Operations & Chief Nuclear Officer is ultimately responsible for completion and safe operation of the NEF and has stop work authority for both the project and operations at the NEF.

The Vice President – Operations & Chief Nuclear Officer is also responsible for ensuring the facility complies with all applicable regulatory requirements. The Vice President – Operations & Chief Nuclear Officer is the Plant Manager. The Plant Manager has direct responsibility for operation of the facility in a safe, reliable and efficient manner. The Plant Manager is responsible for proper selection of staff for all key positions including positions on the Safety Review Committee. The Plant Manager is responsible for the protection of the facility staff and the general public from radiation and chemical exposure and/or any other consequences of an accident at the facility and also bears the responsibility for compliance with the facility license.

B. Deleted~~Vice President- Compliance/General Counsel~~

~~The Vice President – Compliance/General Counsel has the overall responsibility for the development of the LES QA Program and assures its compliance with applicable regulations, codes, and standards. The Vice President – Compliance/General Counsel also has~~

LBDCR-11-0031

~~responsibility for coordinating facility activities to evaluate and assist LES organizations in maintaining compliance with applicable Nuclear Regulatory Commission (NRC) requirements.~~ LBDCR-11-0031

C. Quality Assurance Manager

The Quality Assurance Manager reports to the ~~Vice President~~Director of Compliance~~/General Counsel~~ and has overall responsibility for the management and implementation of the LES QAPD. LBDCR-11-0031

The facility line managers and their staff who are responsible for performing quality-affecting work are responsible for ensuring implementation of and compliance with the QAPD. The QA Manager position maintains reporting relationship independence from management positions at the facility. The QA Manager has a direct relationship with the Vice President - Operations and Chief Nuclear Officer and President for quality concerns with Performance Assessment and Feedback or HS&E. The QA Manager has sufficient independence for all issues affecting quality. In addition the QA Manager has a reporting relationship with the Vice President - Operations and Chief Nuclear Officer and President for adequate stop work authority.

D. Health Safety and Environmental Manager

The Health Safety and Environmental Manager reports to the ~~Vice President~~Director of Compliance~~/General Counsel~~ and has the responsibility for assuring safety at the facility through activities including health and safety activities associated with nuclear criticality safety~~,~~ ~~industrial safety, and chemical safety~~. The Health Safety and Environmental Manager works with the other facility managers to ensure consistent interpretations of health safety, and environmental requirements, performs independent reviews, and supports facility and operations change control reviews. LBDCR-11-0031

This position has a line of communications to the Vice President - Operations and Chief Nuclear Officer to ensure objective health, safety, and environmental audit, review, and control activities are maintained. This position is provided a reporting relationship to the Vice President – Operations & Chief Nuclear Officer level for stop work authority.

E. Operations Director

The Operations Director reports to the Plant Manager and has the responsibility for Shift Operations, Operations Support, Logistics Services, Chemistry and Environmental Services (Waste Analysis, Effluent Monitoring, and Product Assay), and Commissioning and Acceptance. This includes such activities as ensuring the correct and safe operation of UF_6 processes, proper handling of UF_6, and the identification and mitigation of any off normal operating conditions, UF_6 cylinder management (including transportation licensing), directing the scheduling of enrichment operations to ensure smooth production, ensuring proper material and equipment are available for the facility, developing and maintaining production schedules and procedures for enrichment services, ensuring that cylinders of uranium hexafluoride are received and routed correctly at the facility, all transportation licensing and plant and environmental analysis. In the event of the absence of the Plant Manager, the Operations Director may assume the responsibilities and authorities of the Plant Manager.

F. Technical Services Director

The Technical Services Director reports to the Plant Manager and is the operations NEF Design Authority with responsibility for approving any modifications to operating portions of the facility (i.e., portions of the facility that have been formally turned over from the Project and accepted by Operations). The Technical Services Director assumes responsibility for all remaining NEF Design Authority responsibilities for the operating portions of the facility after formal turnover from the Project. NEF Design Authority responsibilities include approving design standards and design criteria, preparing and reviewing the NEF Functional Specification, leading the development and resolution of key technical issues, approving the NEF approved design, and establishing processes for design and configuration control. During the operations phase, after turnover, this also includes technical support for facility modifications (including administration of the configuration management system) and design support for operations and maintenance. Other responsibilities that reside solely with the Technical Services Director include facility management (facility maintenance, warehouse management, and outsourced maintenance supervision), and contamination control (decontamination and waste treatment). The Technical Services Director is also responsible for records management. In the event of the absence of the Plant Manager, the Technical Services Director may assume the responsibilities and authorities of the Plant Manager.

G. Plant Support Director

The Plant Support Director reports to the Plant Manager and has the responsibility for ~~e~~Emergency ~~p~~Planning, Performance Assessment~~material accountability (Safeguards)~~, Training, Administrative Support, and the Procedures Program ~~Radiation Protection~~. ~~This position has the MC&A responsibility for the submission of NRC MC&A reports. This position also ensures proper contamination control.~~ The Plant Support Director, in coordination with the Director, Human Resources & Communications, has the responsibility for providing information about the facility and LES to the public and media, including ensuring that the public and media receive accurate and up-to-date information during an abnormal event at the facility. In the event of the absence of the Plant Manager, the Plant Support Director may assume the responsibilities and authorities of the Plant Manager.

LBDCR-11-0031

~~This position reports to the Vice President - Operations and Chief Nuclear Officer to ensure objective nuclear safety audit, review, and control activities are maintained independent of the Operations Director. This position is intentionally provided a reporting relationship to the Vice President - Operations & Chief Nuclear Officer level for stop work authority.~~

LBDCR-11-0031

H. Commissioning & Acceptance Manager

The Commissioning & Acceptance Manager reports to the Operations Director and has the responsibility for the turnover and commissioning SSCs.

I. Performance Assessment and Feedback Manager

The Performance Assessment and Feedback Manager reports to the ~~Vice President of Compliance/General Counsel~~Director of Plant Support and has the responsibility for organizational performance metrics, and implementing the Corrective Action Program (CAP), Nonconformance Process and Industry Experience Program.

LBDCR-11-0031

J. Quality Assurance Inspectors

The Quality Assurance Inspectors report to the Quality Assurance Manager (via a designated supervisory position, if applicable) and have the responsibility for performing inspections related to the implementation of the LES QAPD.

K. Quality Assurance Auditors

The Quality Assurance Auditors report to the Quality Assurance Manager (via a designated supervisory position, if applicable) and have the responsibility for performing audits related to the implementation of the LES QAPD.

L. Quality Assurance Technical Support

The Quality Assurance Technical Support personnel report to the Quality Assurance Manager (via a designated supervisory position, if applicable) and have the responsibility for providing technical support related to the implementation of the LES QAPD.

M. Emergency Preparedness Manager

The Emergency Preparedness Manager reports to the Plant Support Director and has the responsibility for ensuring the facility remains prepared to react and respond to any emergency situation that may arise. This includes emergency preparedness training of facility personnel, facility support personnel, the training of, and coordination with, offsite emergency response organizations (EROs), and conducting periodic drills to ensure facility personnel and offsite response organization personnel training is maintained up to date.

N. Director of Engineering

The Director of Engineering reports to the Vice President Project and has responsible for developing and managing the URENCO USA Project engineering personnel, procedures, processes and programs to ensure the construction and configuration of the facility is in accordance with the approved design and licensing basis. This position ~~E~~ensures Project engineering procedures and design products are adequately reviewed, approved and controlled to comply with license and regulatory requirements. LBDCR-11-0031

O. Environmental Compliance Officer

The Environmental Compliance Officer reports to the Health, Safety, and Environmental Manager and has the responsibility for coordinating facility activities to ensure all local, state and federal environmental regulations are met. This includes conducting the radiological environmental monitoring program and coordination of the submission of periodic reports with the Chemistry and Environmental Services organization to appropriate regulating organizations of effluents from the facility.

P. Radiation Protection Manager

The Radiation Protection Manager reports to the ~~Plant Support Director~~Director of Compliance and has the responsibility for implementing the Radiation Protection program. These duties include the training of personnel in use of equipment, control of radiation exposure of personnel, and continuous determination of the radiological status of the facility. LBDCR-11-0031

In matters involving radiological protection, the Radiation Protection Manager has direct access to the Plant Manager.

Q. Industrial Safety Officer

The Industrial Safety Officer reports to the ~~Health, Safety, and Environmental Manager~~Director of Programs and Performance and has the responsibility for the implementation of facility industrial safety programs and procedures. This shall include programs and procedures for LBDCR-11-0031 training individuals in safety. The Industrial Safety Officer is also responsible for the preparation and/or review of chemical safety programs and procedures for the facility.

R. Fire Protection Officer

The Fire Protection Officer reports to the Health, Safety and Environmental Manager and has the responsibility for maintaining the performance of the facility fire protection systems.

S. Criticality Safety Officer

Criticality Safety Officer reports to the Health, Safety, and Environmental Manager and is responsible for implementing the Criticality Safety Program in the operating organization, including ensuring that periodic nuclear criticality safety assessments are performed and reported.

T. Criticality Safety Engineers

Criticality Safety Engineers report to the Engineering Manager and are responsible for the preparation and/or review of nuclear safety criticality evaluations and analysis. Nuclear criticality safety evaluations and analyses require independent review by a second Criticality Safety Engineer.

U. Deleted

V. Shift Operations Manager

The Shift Operations Manager reports to the Operations Director, and has the responsibility of directing the day-to-day operation of the facility. This includes such activities as ensuring the correct and safe operation of UF_6 processes, proper handling of UF_6, and the identification and mitigation of any off normal operating conditions. In the event of the absence of the Plant Manager, the Shift Operations Manager may assume the responsibilities and authorities of the Plant Manager. LBDCR-11-0020

W. Shift Managers

The Shift Managers report to the Shift Operations Manager and have the responsibility for ensuring safe operation of enrichment equipment and support equipment. Each Shift Manager directs assigned personnel in order to provide enrichment services in a safe, efficient manner. In the event of the absence of the Plant Manager, the On-Duty Shift Manager may assume the responsibilities and authorities of the Plant Manager. LBDCR-11-0020

X. Safeguards Manager

The Safeguards Manager reports to the ~~Plant Support Director~~Director of Compliance and has the responsibility for ensuring the proper implementation of the FNMC Plan. This position is separate from and independent of the Operations, Technical Services, Construction and Performance Assessment and Feedback departments to ensure a definite division between the safeguards group and the other departments. In matters involving safeguards, the ~~Plant Support Director~~Director of Compliance, which the Safeguards Manager reports to, has direct access to the Vice President - Operations & Chief Nuclear Officer. LBDCR-11-0031 LBDCR-11-0031

Y. Chemistry Services Manager

The Chemistry Services Manager reports to the Operations Director and has the responsibility for the implementation of chemistry analysis programs and procedures for the facility. Chemistry Analysis Activities includes effluent sample collection, chemical and radioactive analysis of effluents, comparison of effluent analysis results to limits, and reporting of chemical analysis of effluents to appropriate regulatory agencies.

Z. Logistics Services Manager

The Logistics Services Manager reports to the Director of Operations and is responsible for production planning, transport planning, uranium administration, safeguards operational support and materials handling, ensuring that cylinders of uranium hexafluoride are received and routed correctly at the facility, and all transportation licensing is properly implemented and maintained.

AA. Engineering Manager

The Engineering Manager reports to the Technical Services Director upon formal turnover of NEF Design Authority responsibilities from Project Engineering to the Technical Services Director. The Engineering Manager has the responsibility for providing engineering and technical support at the facility and maintaining the configuration management system. During the operations phase, the Engineering Manager is responsible for the development of all design changes to the plant and in support of the NEF Design Authority manages and controls the design basis. During all phases of design, construction and operation the Engineering Manager supports the NEF Design Authority by developing and maintaining the processes for design and configuration control and providing technical support for review of proposed changes to the approved design.

BB. Maintenance Manager

The Maintenance Manager reports to the Technical Services Director and has the responsibility of directing and scheduling maintenance activities to ensure proper operation of the facility, including preparation and implementation of maintenance, surveillance, and test procedures. This includes activities such as repair and preventive maintenance of facility equipment. The Maintenance Manager is responsible for plant systems availability and reliability as well as for coordinating and maintaining testing programs for the facility, including the testing of systems and components to ensure the systems and components are functioning as specified in design documents.

CC. Security Manager

The Security Manager reports to the Vice President of Operations and has the responsibility for directing the activities of security personnel to ensure the physical protection of the facility. The Security Manager is also responsible for the protection of classified matter at the facility and obtaining security clearances for facility personnel and support personnel.

DD. Information Services Manager

The Information Services Manager reports to the Technical Services Director and has the responsibility for adequately controlling documents at the facility.

EE. Training ~~and Support Services~~ Manager

The Training ~~and Support Services~~ Manager reports to the ~~Vice President of Operations~~Plant Support Director and has the responsibility for conducting training and maintaining training

LBDCR-11-0031

records for personnel at the facility. ~~In the event of the absence of the Plant Manager, the Training and Support Services Manager may assume the responsibilities and authorities of the Plant Manager.~~ LBDCR-11-0031

FF. Procurement Director

The Procurement Director reports to the Chief Financial Officer and has the responsibility for ensuring spare parts and other materials needed for operation of the facility are ordered, received, inspected and stored properly.

GG. Deleted

HH. Deleted

II. Director of Compliance

The Director of Compliance reports to the Plant Manager and has the responsibility for Quality Assurance, Operational Health, Safety, and Environmental responsibilities, Radiation Protection and Material Control and Accountability (Safeguards). This position ensures proper contamination control; has the responsibility for the submittal of NRC MC&A reports; and has overall responsibility for development of the LES QA Program.

This position reports to the Vice President – Operations and Chief Nuclear Officer (Plant Manager) to ensure objective nuclear safety audit, review, and control activities are maintained independent of the Operations Director. This position is intentionally provided a reporting relationship to the Vice President – Operations & Chief Nuclear Officer level for stop work authority. LBDCR-11-0031

JJ. Director of Programs and Performance

The Director of Programs and Performance leads the Programs and Performance department of the Project organization. This position encompasses the Corrective Action Program (CAP), Work Plans Management, Project Contracts and Industrial Safety for Construction, testing and turnover for various phases of the project. This position reports to the Vice President of Project.

2.2.2 Shift Crew Composition

The minimum operating shift crew consists of a Shift Manager (or Deputy Shift Manager in the absence of the Shift Manager), one Control Room operator, one operator for each SBM, security personnel, and one Radiation Protection Staff member or operator trained to monitor and perform routine radiological protection activities and certain, time-critical, radiation protective actions described in the NEF Emergency Plan. When only one SBM is in operation, a minimum of two operators is required.

At least one criticality safety engineer or the criticality safety officer will be available, with appropriate ability to be contacted by the Shift Manager, to respond to any routine request or emergency condition. This availability may be offsite if adequate communication ability is provided to allow response as needed.

final disposition of waste), and (b) experience with chemical materials and/or processes. Relevant work experience of at least five years, in addition to the minimum experience requirements specified in the section, may be substituted for educational Bachelor's degree requirements. The Vice President - Operations and Chief Nuclear Officer may approve different experience requirements for key positions. Approval of different requirements shall be done in writing and only on a case-by-case basis.

The assignment of individuals to the Manager positions reporting directly to the Plant Manager, and to positions on the SRC, shall be approved by the Plant Manager. Assignments to all other staff positions shall be made within the normal administrative practices of the facility.

The actual qualifications of the individuals assigned to the key facility positions described in Section 2.2.1, Operating Organization will be maintained in the employee personnel files or other appropriate file at the facility. Development and maintenance of qualification records and training programs are the responsibility of the Training ~~and Support Services~~ Manager. LBDCR-11-0031

A. Deleted

B. Vice President – Operations & Chief Nuclear Officer

The President of LES, based on the individual's experience, proven ability in management of large scale facilities, and overall leadership qualities, appoints the Vice President - Operations & Chief Nuclear Officer.

This appointment by the President of LES reflects confidence in the individual's ability as effective programs, operations, regulatory, and business manager. The Vice President - Operations & Chief Nuclear Officer shall have, as a minimum, a bachelor's degree (or equivalent) and at least ten years related experience and/or training, or twenty years of related experience.

The Vice President – Operations & Chief Nuclear Officer is the Plant Manager, who is the overall manager of the facility. The Plant Manager shall be knowledgeable of the enrichment process, enrichment process controls and ancillary processes, criticality safety control, chemical safety, industrial safety, and radiation protection program concepts as they apply to the overall safety of a nuclear facility. The Plant Manager shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and ten years of responsible nuclear experience.

C. Quality Assurance Manager

The Quality Assurance Manager shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and at least six years of responsible nuclear experience in the implementation of a quality assurance program. The QA Manager shall have at least four years experience in a QA organization at a nuclear facility.

D. Health, Safety, and Environmental Manager

The Health, Safety, and Environmental Manager shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and at least five years of responsible nuclear experience in HS&E or related disciplines. The Health, Safety, and Environmental Manager shall also have at least one year of experience/familiarity associated with nuclear criticality safety programs.

V. Maintenance Manager

The Maintenance Manager shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and four years of responsible nuclear experience.

W. Security Manager

The Security Manager shall have a bachelor's degree (or equivalent) and five years of experience or an associates degree (or equivalent) and ten years of experience. Experience must be in the management of physical security at a facility requiring security capabilities similar to that required for the facility.

X. Training ~~and Support Services~~ Manager

The Training ~~and Support Services~~ Manager shall have a minimum of five years of appropriate, responsible experience in implementing and supervising a training program.

LBDCR-11-0031

Y. Fire Protection Officer

The Fire Protection Officer shall have bachelor's degree (or equivalent) and shall be trained in the field of fire protection and have practical day-to-day experience at nuclear facilities.

Z. Information Services Manager

The Information Services Manager shall have a minimum of three years of appropriate, responsible experience in implementing and supervising a document control program.

AA. Performance Assessment and Feedback Manager

The Performance Assessment and Feedback Manager shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and four years of responsible nuclear experience.

BB. Procurement Director

The Procurement Director shall have, as a minimum, a bachelor's degree (or equivalent) and have a minimum of three years of appropriate, responsible experience in implementing and supervising a procurement program.

CC. Deleted

DD. Deleted~~Vice President of Compliance/General Counsel~~

~~The Vice President of Compliance/General Counsel shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and have a minimum of six years of appropriate, responsible nuclear experience of which at least four year are in the areas of quality and/or regulatory experience.~~

LBDCR-11-0031

EE. Director of Compliance

The Director of Compliance shall have, as a minimum, a bachelor's degree (or equivalent) in an engineering or scientific field and four years of responsible nuclear experience.

LBDCR-11-0031

FF. Director of Programs and Performance

The Director of Programs and Performance shall have at a minimum, a Bachelor's degree (or equivalent) and have a minimum (12) years related management or leadership experience associated with Programs and Performance indicators at a Nuclear or Chemical Plant Processing facility or related start-up construction experience of which 4 years may be substituted for a Bachelors degree. LBDCR-11-0031

- Functional testing.

These maintenance categories are discussed in detail in Chapter 11, Management Measures.

2.3.3 Training and Qualifications

Prescribed training programs shall be established for NEF employees. General Employee Training shall be provided to employees prior to receiving unescorted access, and shall address safety preparedness for all safety disciplines (criticality, radiological, chemical, industrial), ALARA practices, and emergency procedures. In-depth training programs shall be provided to individuals depending on job requirements in the areas of radiological safety (for all personnel with access to a Radiologically Controlled Area (RCA)) and in criticality safety control. Nuclear criticality safety training shall satisfy the recommendations of ANSI/ANS-8.20, Nuclear Criticality Safety Training. Continuing training of personnel previously trained shall be performed for radiological and criticality safety at least annually, and shall include updating and changes in required skills. The training program shall include methods for verifying training effectiveness, such as written tests, actual demonstration of skills, and where required by regulation, maintaining a current and valid license demonstrating qualification. Changes to training shall be implemented if indicated due to incidents potentially compromising safety, or if changes are made to facilities or processes.

The training programs and maintenance of the training program records at the facility are the responsibility of the Training ~~and Support Services~~ Manager. Accurate records are maintained on each employee's qualifications, experience, and training. The employee training file shall include records of all general employee training, technical training, and employee development training conducted at the facility. The employee training file shall also contain records of special company sponsored training conducted by others. The training records for each individual are maintained so that they are accurate and retrievable. Training records are retained in accordance with the records management system.

| LBDCR-11-0031

Additional details on the facility training program are provided in Chapter 11, Management Measures.

2.3.4 Procedures

Activities involving licensed materials will be conducted through the use of approved, written procedures. Applicable procedure and training requirements will be satisfied before use of the procedure. Procedures will be used to control activities in order to ensure the activities are carried out in a safe manner.

Generally, four types of plant procedures are used to control activities: operating procedures, administrative procedures, maintenance procedures, and emergency procedures. Operating procedures, developed for workstation and control room operators, are used to directly control process operations. Administrative procedures are written by each department as necessary to control activities that support process operations, including management measures (e.g. configuration management, training and record-keeping). Maintenance procedures address preventive and corrective maintenance, surveillance (includes calibration, inspection, and other surveillance testing), functional testing following maintenance, and requirements for pre-maintenance activity involving reviews of the work to be performed and reviews of

2.3.6 Incident Investigations

The Corrective Action Program (CAP) is described in detail in Section 11.6 and the QAPD Section 16, Corrective Action. Each event is considered in terms of its requirements for reporting in accordance with regulations and is evaluated to determine the level of investigation required. These evaluations and investigations are conducted in accordance with approved CAP procedures. The depth of the investigation depends upon the severity of the incident in terms of the levels of uranium released and/or the degree of potential for exposure of workers, the public or the environment.

2.3.7 Employee Concerns

Employees who feel that safety or quality is being compromised have the right and responsibility to initiate the "stop work" process in accordance with the applicable project or facility procedures to ensure the work environment is placed in a safe condition.

Employees also have access to various resources to ensure their safety or quality concerns are addressed, including:

- line management or other facility management (e.g., Performance Assessment and Feedback Management, Plant Manager, HS&E Manager, Plant Support Director, ~~Vice President~~Director of Compliance~~/General Counsel~~ LBDCR-11-0031
- the facility safety organization (i.e., any of the safety engineers or managers)
- NRC's requirements under 10 CFR 19, Notices, Instructions and Reports to Workers: Inspection and Investigations (CFR, 2003a)
- LES CAP - a simple mechanism available for use by any person at the NEF site for reporting unusual events and potentially unsafe conditions or activities.

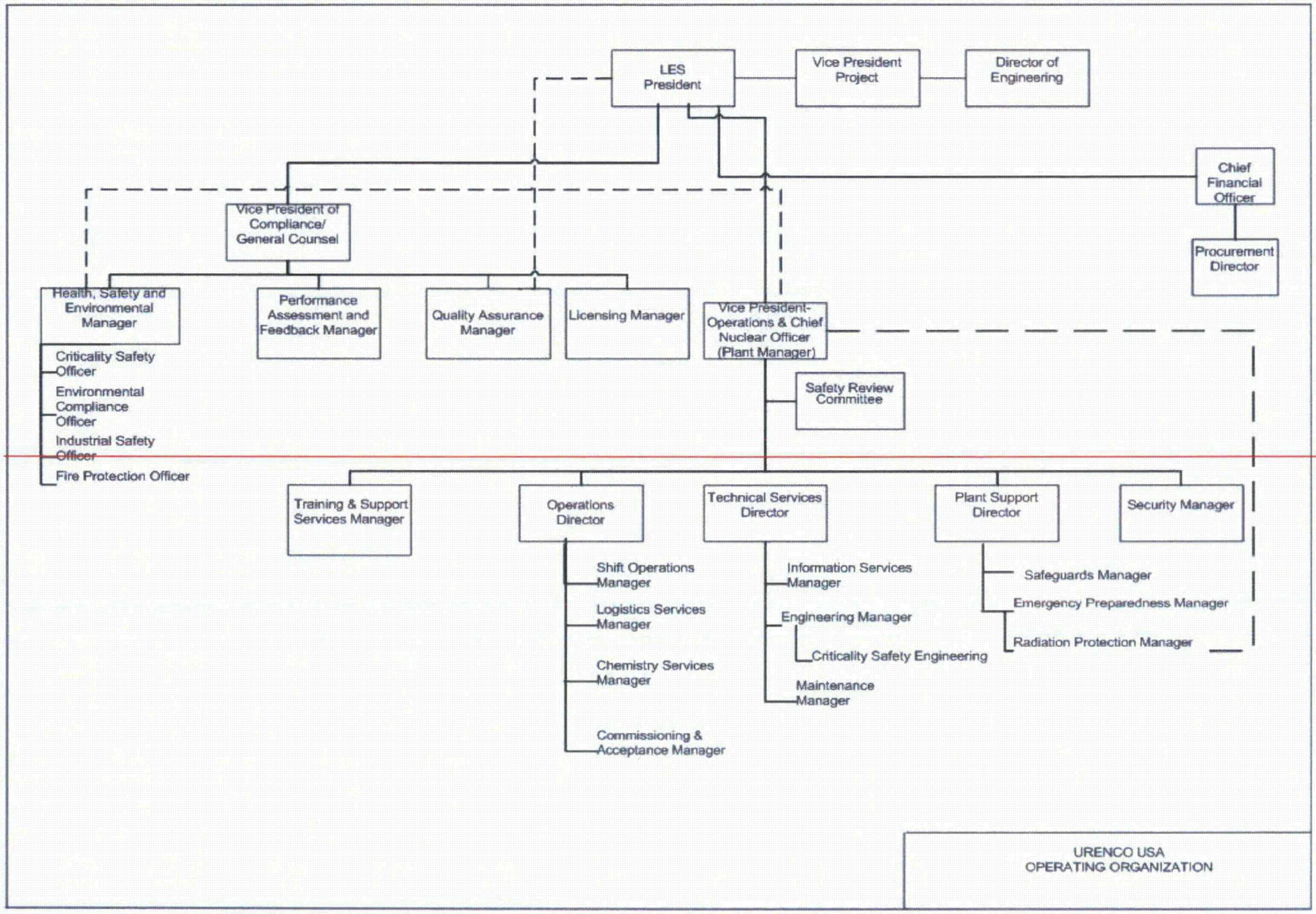
2.3.8 Records Management

Procedures are established which control the preparation and issuance of documents such as manuals, instructions, drawings, procedures, specifications, and supplier-supplied documents, including any changes thereto. Measures are established to ensure documents, including revisions, are adequately reviewed, approved, and released for use by authorized personnel.

Document control procedures require documents to be transmitted and received in a timely manner at appropriate locations including the location where the prescribed activity is to be performed. Controlled copies of these documents and their revisions are distributed to and used by the persons performing the activity.

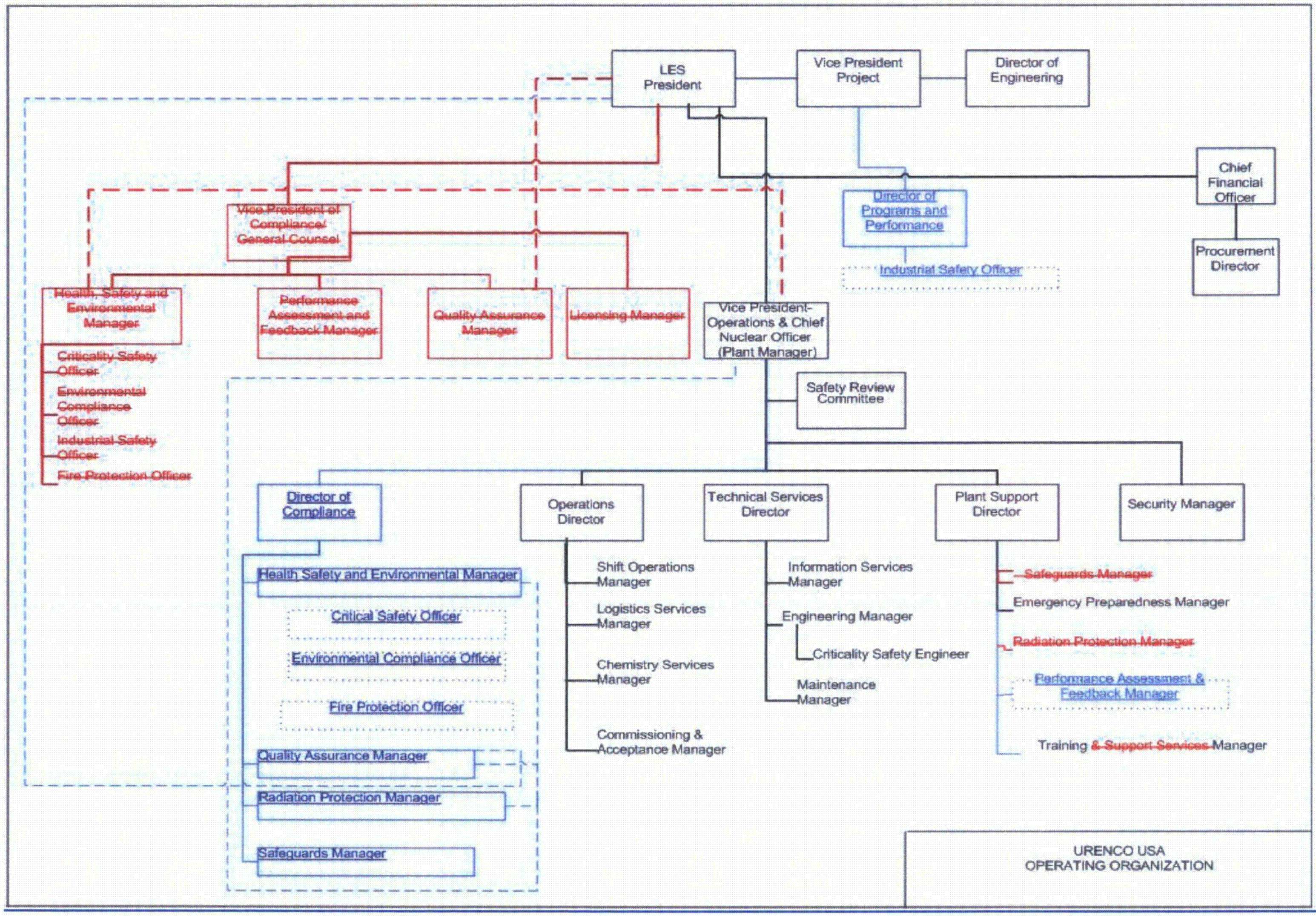
Superseded documents are destroyed or are retained only when they have been properly labeled. Indexes of current documents are maintained and controlled.

The QA Program assigns responsibility for verifying QA record retention to the QA Manager. Applicable design specifications, procurement documents, or other documents specify the QA records to be generated by, supplied to, or held, in accordance with approved procedures. QA records are not considered valid until they are authenticated and dated by authorized personnel.


LES President
Vice President Project
Director of Engineering
Chief Financial Officer
Procurement Director
Vice President of Compliance/ General Counsel
Health, Safety and Environmental Manager
Criticality Safety Officer
Environmental Compliance Officer
Industrial Safety Officer
Fire Protection Officer
Performance Assessment and Feedback Manager
Quality Assurance Manager
Licensing Manager
Vice President- Operations & Chief Nuclear Officer (Plant Manager)
Safety Review Committee
Training & Support Services Manager
Operations Director
Shift Operations Manager
Logistics Services Manager
Chemistry Services Manager
Commissioning & Acceptance Manager
Technical Services Director
Information Services Manager
Engineering Manager
Criticality Safety Engineering
Maintenance Manager
Plant Support Director
Safeguards Manager
Emergency Preparedness Manager
Radiation Protection Manager
Security Manager

URENCO USA
OPERATING ORGANIZATION

LBDCR-11-0031


LES President
Vice President Project
Director of Engineering
Chief Financial Officer
Procurement Director
Director of Programs and Performance
Industrial Safety Officer
~~Vice President of Compliance/ General Counsel~~
~~Health, Safety and Environmental Manager~~
~~Performance Assessment and Feedback Manager~~
~~Quality Assurance Manager~~
~~Licensing Manager~~
~~Criticality Safety Officer~~
~~Environmental Compliance Officer~~
~~Industrial Safety Officer~~
~~Fire Protection Officer~~
Vice President-Operations & Chief Nuclear Officer (Plant Manager)
Safety Review Committee
Director of Compliance
Health Safety and Environmental Manager
Critical Safety Officer
Environmental Compliance Officer
Fire Protection Officer
Quality Assurance Manager
Radiation Protection Manager
Safeguards Manager
Operations Director
Shift Operations Manager
Logistics Services Manager
Chemistry Services Manager
Commissioning & Acceptance Manager
Technical Services Director
Information Services Manager
Engineering Manager
Criticality Safety Engineer
Maintenance Manager
Plant Support Director
~~Safeguards Manager~~
Emergency Preparedness Manager
~~Radiation Protection Manager~~
Performance Assessment & Feedback Manager
Training ~~& Support Services~~ Manager
Security Manager
URENCO USA
OPERATING ORGANIZATION

LBDCR-11-0031

Figure 2.1-2 LES National Enrichment Facility Operating Organization

3.1.3 Management Measures

Management measures are functions applied to IROFS, and any items that are essential to ~~may affect~~ the function of IROFS. IROFS management measures ensure compliance with the performance requirements assumed in the ISA documentation. The measures are applied to particular structures, systems, equipment, components, and activities of personnel, and may be graded commensurate with the reduction of the risk attributable to that IROFS. The IROFS management measures shall ensure that these structures, systems, equipment, components, and activities of personnel within the identified IROFS boundary are designed, implemented, and maintained, as necessary, to ensure they are available and reliable to perform their function when needed, to comply with the performance requirements assumed in the ISA documentation.

LBDCR-11-0034

The following types of management measures are required by the 10 CFR 70.4 (CFR, 2003b) definition of management measures. The description for each management measure reflects the general requirements applicable to each IROFS. Any management measure that deviates from the general requirements described in this section, which are consistent with the performance requirements assumed in the ISA documentation, are discussed in the National Enrichment Facility Integrated Safety Analysis Summary.

Configuration Management

The configuration management program is required by 10 CFR 70.72 (CFR, 2003f) and establishes a system to evaluate, implement, and track each change to the site, structures, processes, systems, equipment, components, computer programs, and activities of personnel. Configuration management of IROFS, and any items that are essential to ~~may affect~~ the function of IROFS, is applied to all items identified within the scope of the IROFS boundary. Any change to structures, systems, equipment, components, and activities of personnel within the identified IROFS boundary must be evaluated before the change is implemented. If the change requires an amendment to the License, Nuclear Regulatory Commission approval is required prior to implementation.

LBDCR-11-0034

Maintenance

Maintenance of engineered IROFS, and any items that are essential to ~~may affect~~ the function of IROFS, encompasses planned surveillance testing and preventative maintenance, as well as unplanned corrective maintenance. Implementation of approved configuration management changes to hardware is also generally performed as a planned maintenance function.

LBDCR-11-0034

Planned surveillance testing (e.g., functional/performance testing, instrument calibrations) monitors the integrity and capability of IROFS, and any items that are essential to ~~may affect~~ the function of IROFS, to ensure they are available and reliable to perform their function when needed, to comply with the performance requirements assumed in the ISA documentation. All necessary periodic surveillance testing is generally performed on an annual frequency (any exceptions credited within the ISA are discussed in the National Enrichment Facility Integrated Safety Analysis Summary).

LBDCR-11-0034

Planned preventative maintenance (PM) includes periodic refurbishment, partial or complete overhaul, or replacement of engineered IROFS, as necessary, to ensure the continued availability and reliability of the safety function assumed in the ISA documentation. In determining the frequency of any PM, consideration is given to appropriately balancing the objective of preventing failures through maintenance, against the objective of minimizing unavailability of IROFS because of PM. In addition, feedback from PM and corrective maintenance and the results of incident investigations and identified root causes are used, as appropriate, to modify the frequency or scope of PM.

Planned maintenance on engineered IROFS, or any items that are essential to~~may affect~~ the function of IROFS, that do not have redundant functions available, will provide for compensatory measures to be put into place to ensure that the IROFS function is performed until it is put back into service. LBDCR-11-0034

For an IROFS that is found to be degraded or impaired by planned operations, maintenance, or construction activities: a compensatory measure may be used to ensure that the function of the IROFS is compensated until it is returned to service. For example, a continuous fire watch may be used to compensate for a degraded IROFS barrier.

Corrective maintenance involves repair or replacement of equipment that has unexpectedly degraded or failed. Corrective maintenance restores the equipment to acceptable performance through a planned, systematic, controlled, and documented approach for the repair and replacement activities.

Following any maintenance on IROFS, and before returning an IROFS to operational status, functional testing of the IROFS, as necessary, is performed to ensure the IROFS is capable of performing its intended safety function.

Training and Qualifications

IROFS, and any items that are essential to~~may affect~~ the function of IROFS, require that personnel involved at each level (from design through and including any assumed process implementation steps or actions) have and maintain the appropriate training and qualifications. Employees are provided with training to establish the knowledge foundation and on-the-job training to develop work performance skills. For process implemented steps or actions, a needs/job analysis is performed and tasks are identified to ensure that appropriate training is provided to personnel working on tasks related to IROFS. Minimum training requirements are developed for those positions whose activities are related to IROFS. Initial identification of job-specific training requirements is based on experience. Entry-level criteria (e.g., education, technical background, and/or experience) for these positions are contained in position descriptions. LBDCR-11-0034

Qualification is indicated by successful completion of prescribed training, demonstration of the ability to perform assigned tasks, and where required by regulation, maintaining a current and valid license or certification.

Continuing training is provided, as required, to maintain proficiency in specific knowledge and skill related activities. For all IROFS, and any items that are essential to~~may affect~~ the function of IROFS, involving process implemented steps or actions, annual refresher training or requalification is generally required as identified in the needs/job analysis referenced in the previous paragraph. (any exceptions credited within the ISA are discussed in the National Enrichment Facility Integrated Safety Analysis Summary). LBDCR-11-0034

Procedures

All activities involving IROFS, and any items that are essential to~~may affect~~ the function of IROFS, are conducted in accordance with approved procedures. Each of the other IROFS management measures (e.g., configuration management, maintenance, training) is implemented via approved procedures. These procedures are intended to provide a pre-planned method of conducting the activity in order to eliminate errors due to on-the-spot analysis and judgments.

LBDCR-11-0034

All procedures are sufficiently detailed that qualified individuals can perform the required functions without direct supervision. However, written procedures cannot address all contingencies and operating conditions. Therefore, they contain a degree of flexibility appropriate to the activities being performed. Procedural guidance exists to identify the manner in which procedures are to be implemented. For example, routine procedural actions may not require the procedure to be present during implementation of the actions, while complex jobs, or checking with numerous sequences may require valve alignment checks, approved operator aids, or in-hand procedures that are referenced directly when the job is conducted.

To support the requirement to minimize challenges to IROFS, and any items that are essential to~~may affect~~ the function of IROFS, specific procedures for abnormal events are also provided. These procedures are based on a sequence of observations and actions to prevent or mitigate the consequences of an abnormal situation.

LBDCR-11-0034

Audits and Assessments

Audits are focused on verifying compliance with regulatory and procedural requirements and licensing commitments. Assessments are focused on effectiveness of activities and ensuring that IROFS are reliable and are available to perform their intended safety functions as documented in the ISA. The frequency of audits and assessments is based upon the status and safety importance of the activities being performed and upon work history. However, at a minimum, all activities associated with maintaining IROFS will generally be audited or assessed on an annual basis (any exceptions credited within the ISA are discussed in the National Enrichment Facility Integrated Safety Analysis Summary).

Incident Investigations

Incident investigations are conducted within the Corrective Action Program (CAP). Incidents associated with IROFS, and any items that are essential to~~may affect~~ the function of IROFS, encompass a range of items, including (a) processes that behave in unexpected ways, (b) procedural activities not performed in accordance with the approved procedure, (c) discovered deficiency, degradation, or non-conformance with an IROFS, or any items that are essential to~~may affect~~ the function of IROFS. Additionally, audit and assessment results are tracked in the Corrective Action Program.

LBDCR-11-0034

Feedback from the results of incident investigations and identified root causes are used, as appropriate, to modify management measures to provided continued assurance that the reliability and availability of IROFS remain consistent with the performance requirements assumed in the ISA documentation.

Records Management

All records associated with IROFS, and any items that are essential to~~may affect~~ the function of IROFS, shall be managed in a controlled and systematic manner in order to provide identifiable and retrievable documentation. Applicable design specifications, procurement documents, or other documents specify the QA records to be generated by, supplied to, or held, in accordance with approved procedures are included. LBDCR-11-0034

Other Quality Assurance Elements

Other quality assurance elements associated with IROFS, or any items that are essential to~~may affect~~ the function of IROFS, that are required to ensure the IROFS is available and reliable to perform the function when needed to comply with the performance requirements assumed in the ISA documentation, are discussed in the National Enrichment Facility Integrated Safety Analysis Summary. LBDCR-11-0034

3.2 Integrated Safety Analysis Methods

This section outlines the approach utilized for performing the integrated safety analysis (ISA) of the process accident sequences. The approach used for performing the ISA is consistent with Example Procedure for Accident Sequence Evaluation, Appendix A to Chapter 3 of NUREG-1520. This approach employs a semi-quantitative risk index method for categorizing accident sequences in terms of their likelihood of occurrence and their consequences of concern. The risk index method framework identifies which accident sequences have consequences that could exceed the performance requirements of

10 CFR 70.61 (CFR, 2003c) and, therefore, require designation of items relied on for safety (IROFS) and supporting management measures. Descriptions of these general types of higher consequence accident sequences are reported in the ISA Summary.

The ISA is a systematic analysis to identify plant and external hazards and the potential for initiating accident sequences, the potential accident sequences, the likelihood and consequences, and the IROFS.

The hazard and operability (HAZOP) analysis method was used initially to identify hazards for the Uranium Hexafluoride (UF_6) process systems and Technical Services Building (TSB) systems. This method is consistent with the guidance provided in NUREG-1513. The choice of a particular method or combination of methods is dependent upon a number of factors including:

- Analysis problem characteristics
- Motivation for the study
- Perceived risk associated with the subject process or activity
- Resource availability and analyst/management preference
- Type of information available to perform the study
- Type of results needed

To satisfy NRC requirements as defined in Part 70, a method should be chosen that is capable of identifying specific accident/even sequences in addition to the safety controls that prevent such accidents or mitigate their consequences. The HAZOP method has this capability.

NUREG-1513 identifies several methods in addition to the HAZOP method [e.g.~~(i.e.~~, What-If/Checklist,~~ and~~ Failure Modes and Effects Analysis (FMEA),~~)~~ Fault Tree Analysis, Event Tree Analysis, Cause-Consequence Analysis, Human Reliability Analysis, etc.] that may be implemented. The guidance from NUREG-1513 will be followed for selection of a hazard analysis method. Furthermore, any hazard analysis method may be used as described in, and in accordance with, NUREG-1513. Thus, the hazard analysis methods that may be used are not limited to those briefly described in this ISA Methods section.

LBDCR-11-0046

LBDCR-11-0046

The ISA Team reviewed the hazard identified for the "credible worst-case" consequences. All credible high or intermediate severity consequence accident scenarios were assigned accident sequence identifiers, accident sequence descriptions, and a risk index determination was made.

The risk index method is regarded as a screening method, not as a definitive method of proving the adequacy or inadequacy of the IROFS for any particular accident.

the corresponding critical design attribute. For components that require a more detailed criticality analysis (i.e., second category of safe-by-design components), significant margin is defined as $k_{eff} < 0.95$, where $k_{eff} = kcalc + 3\sigma calc$. This margin is considered acceptable since the calculation of k_{eff} also conservatively assumes the components are full of uranic breakdown material at maximum enrichment, the worst credible moderation conditions exist, and the worst credible reflection conditions exist. In addition, the configuration management system required by 10 CFR 70.72 (implemented by the NEF Configuration Management Program) ensures the maintenance of the safety function of these features and assures compliance with the double contingency principle, as well as the defense-in-depth criterion of 10 CFR 70.64(b).

Guidance from revisions of issued versions of NUREG 1520 was used in creating the definition of "not credible."~~The definition of "not credible" is also taken from NUREG-1520.~~ If an event is not credible, IROFS are not required to prevent or mitigate the event. The fact that an event is not "credible" must not depend on any facility feature that could credibly fail to function. One cannot claim that a process does not need IROFS because it is "not credible" due to characteristics provided by IROFS. The implication of "credible" in 10 CFR 70.61 (CFR, 2003c) is that events that are not "credible" may be neglected.

LBDCR-11-0046

Any one of the following independent acceptable sets of qualities could define an event as not credible:

a. An external event for which the frequency of occurrence can conservatively be estimated as less than once in a million years

b. A process deviation that consists of a sequence of many unlikely ~~human actions~~events or errors for which there is no reason or motive. ~~(~~In determining that there is no reason for such errors~~actions~~, a wide range of possible motives, short of intent to cause harm, must be considered. Complete ignorance of safe procedures is possible for untrained personnel, which should be considered a credible possibility. Obviously~~Necessarily~~, no ~~such~~ sequence of events should be categorized as not credible if it has actually occurred~~can ever have actually happened~~ in any fuel cycle facility.~~)~~

LBDCR-11-0046

c. Process deviations for which there is a convincing argument, given physical laws that they are not possible, or are unquestionably extremely unlikely.

3.2.5.3 Risk Matrix

The three categories of consequence and likelihood can be displayed as a 3 x 3 risk index matrix. By assigning a number to each category of consequence and likelihood, a qualitative risk index can be calculated for each combination of consequence and likelihood. The risk index equals the product of the integers assigned to the respective consequence and likelihood categories. The risk index matrix, along with computed risk index values, is illustrated in Table 3.1-6, Risk Matrix with Risk Index Values. The shaded blocks identify accidents of which the consequences and likelihoods yield an unacceptable risk index and for which IROFS must be applied.

The risk indices can initially be used to examine whether the consequences of an uncontrolled and unmitigated accident sequence (i.e., without any IROFS) could exceed the performance requirements of 10 CFR 70.61 (CFR, 2003c). If the performance requirements could be exceeded, IROFS are designated to prevent the accident or to mitigate its consequences to an acceptable level. A risk index value less than or equal to four means the accident sequence is

3.4 Compliance Item Commitments

3.4.1 **For accident sequences PT3-5, ~~PB1-3,~~ FR1-1, FR1-2, FR2-1, FR2-2, DS1-1, DS1-2, DS2-1, DS2-2, DS3-1, DS3-2, SW1-1, SW1-2, LW1-2, LW1-3, RD1-1**, and EC3-1, an Initiating Event Frequency (IEF) index number of "-2" may be assigned based on evidence from the operating history of similar designed Urenco European plants. Detailed justifications for the IEF index numbers of "-2" will be developed during detailed design. If the detailed justification does not support the IEF index number of "-2," then the IEF index number assigned and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with overall ISA methodology.

LBDCR-11-0029

3.4.2 **For Administrative Control IROFS that involve "use of" a component or device**, a Failure Probability Index Number (FPIN) of "-2" may be assigned provided the IROFS is a routine, simple, action that either: (1) involves only one or two decision points or (2) is highly detailed in the associated implementing procedure. Alternately, an FPIN of "-3" may be assigned for this type of IROFS provided the criteria specified above for an FPIN of "-2" are met and the IROFS is enhanced by requiring independent verification of the safety function. This enhancement shall meet the requirements for independent verification identified in item 3.4.5 below. If these criteria cannot be met, then the FPIN assigned to the IROFS and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with the overall ISA methodology.

3.4.3 **For Administrative Control IROFS that involve "verification of" a state or condition**, an FPIN of "-2" may be assigned provided the IROFS is a routine action performed by one person, with proceduralized, objective, acceptance criteria. Alternately, an FPIN of "-3" may be assigned for this type of IROFS provided the criteria specified above for an FPIN of "-2" are met and the IROFS is enhanced by requiring independent verification of the safety function. This enhancement shall meet the requirements for independent verification identified in item 3.4.5 below. If these criteria cannot be met, then the FPIN assigned to the IROFS and the associated accident sequence(s) will be re-evaluated and revised, as necessary, consistent with the overall ISA methodology.

3.4.4 **For Administrative Control IROFS that involve "independent sampling,"** different samples are obtained and an FPIN of "-2" may be assigned provided at least three of the following four criteria are met.

1. Different methods/techniques are used for sample analysis.
2. Samples are obtained from different locations.
3. Samples are obtained at different times. The time period between collection of the different samples shall be sufficient to ensure results are meaningful and representative of the material sampled.
4. Samples are obtained by different personnel.

- AISC Manual of Steel Construction
- ANSI/AISC N690, American National Standard Specification for the Design, Fabrication, and Erection of Steel Safety-Related Structures for Nuclear Facilities

Historical Note: Fillet weld inspections performed on Cascades 1 and 2 upper steel in SBM1001 Assay Unit 1, under ANSI/AISC N690-1994 and AWS D1. 1, involved use of an alternate weld inspection methodology as approved by the NRC in LAR 11-04. This method, delineated in TQ-2010-102 which has been superseded by TQ-2011-11 to eliminate groove weld applications, involved a through paint weld assessment and engineering evaluation for disposition of identified weld defects.

LBDCR-11-0043

- PCI Design Handbook
- American Society of Testing and Materials

3.4.23 Structural Design Loads

a. Wind loadings for structures are in accordance with provisions of the International Building Code and Section 6.5 of ASCE 7.

b. For reinforced concrete targets, the formulas used to establish the missile depth of penetration (x) and scabbing thickness (ts) are based on the Modified National Defense Research Committee Formula (NDRC) (ASCE, 58) and the Army Corps of Engineers Formula (ACE) (ASCE, 58) respectively.

c. Per Section C.7.2.1 of ACI 349, the concrete thickness required to resist hard missiles shall be at least 1.2 times the scabbing thickness, ts. Punching shear is calculated and checked against the requirements of ACI 349, Section C.7.2.3.

d. For steel targets, the formula used to establish the perforation thickness is the Ballistic Research Laboratory (BRL) Formula (ASCE, 58).

e. All buildings and structures, including such items as equipment supports, are designed to withstand the earthquake loads defined in Sections 1615 through 1617 of the International Building Code.

f. Extreme snow loadings on roofs of safety significant structures are based on a ground snow load of 32 lb/ft^2. The snow load for safety significant structures is enveloped by the general 40 lb/ft^2 roof live load with the exception of drift areas. Drift areas (where load can exceed 40 lb/ft^2) are evaluated when required for each structure.

   Quality Level 3 structures will as a minimum, meet the IBC requirements for snow loading.

g. Load combinations for concrete structures and components for the safety significant structures are based on ACI 349 except for SBMs which may be based on ACI 318. Load combinations for other concrete structures are based on (ACI 318). All concrete structures are designed using the ACI Strength Design Method (ACI 318).

h. Load combinations for steel structures and components for all buildings are provided in ISAS Section 3.3.2.2.8. All structural steel is designed using the AISC Allowable Stress Method (AISC, Manual of Steel Construction).

i. Design live loads, including impact loads, used are in accordance with Section 4.0 and Table 4-1 of ASCE 7.

j. During detailed design of specific buildings and areas, pressure loads due to postulated truck and pipeline explosions will be considered. The pressure loads will

5.1 The Nuclear Criticality Safety (NCS) Program

The facility has been designed and will be constructed and operated such that a nuclear criticality event is prevented, and to meet the regulatory requirements of 10 CFR 70 (CFR, 2003a). Nuclear criticality safety at the facility is assured by designing the facility, systems and components with safety margins such that safe conditions are maintained under normal and abnormal process conditions and any credible accident. Items Relied On For Safety (IROFS) identified to ensure subcriticality are discussed in the NEF Integrated Safety Analysis Summary.

5.1.1 Management of the Nuclear Criticality Safety (NCS) Program

The NCS criteria in Section 5.2, Methodologies and Technical Practices, are used for managing criticality safety and include adherence to the double contingency principle as stated in the ANSI/ANS-8.1, Nuclear Criticality Safety In Operations with Fissionable Materials Outside Reactors. The adopted double contingency principle states "process design should incorporate sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible." Each process that has accident sequences that could result in an inadvertent nuclear criticality at the NEF meets the double contingency principle. The NEF meets the double contingency principle in that process design incorporates sufficient factors of safety to require at least two unlikely, independent, and concurrent changes in process conditions before a criticality accident is possible.

The plant will produce uranium enriched in isotope ^{235}U no greater than the LES license limit~~5.0 $^{w}/_{o}$ enrichment~~. However, as additional conservatism, most nuclear criticality safety analyses for enriched material are performed assuming a ^{235}U enrichment of 6.0 $^{w}/_{o}$, and include appropriate margins to safety. The exceptions to this are the systems and components associated with a cascade dump which are analyzed assuming 1.5 $^{w}/_{o}$. These include the Contingency Dump System equipment and piping on the 2nd floor of the Process Services Area and the Tails Take-off System. In accordance with 10 CFR 70.61(d) (CFR, 2003b), the general criticality safety philosophy is to prevent accidental uranium enrichment excesses, provide geometrical safety when practical, provide for moderation controls within the UF_6 processes and impose strict mass limits on containers of aqueous, solvent based, or acid solutions containing uranium. Interaction controls provide for safe movement and storage of components. Plant and equipment features assure prevention of excessive enrichment. The plant is divided into distinctly separate Assay Units (called Cascade Halls) with no common UF_6 piping. UF_6 blending is done in a physically separate portion of the plant. Process piping, individual centrifuges and chemical traps other than the contingency dump chemical traps, are safe by limits placed on their diameters. Product cylinders rely upon uranium enrichment, moderation control and mass limits to protect against the possibility of a criticality event. Each of the liquid effluent collection tanks that hold uranium in solution is mass controlled, as none are geometrically safe. As required by 10 CFR 70.64(a) (CFR, 2003c), by observing the double contingency principle throughout the plant, a criticality accident is prevented. In addition to the double contingency principle, effective management of the NCS Program includes:

LBDCR-11-0030

- An NCS program to meet the regulatory requirements of 10 CFR 70 (CFR, 2003a) will be developed, implemented, and maintained.
- Safety parameters and procedures will be established.
- The NCS program structure, including definition of the responsibilities and authorities of key program personnel will be provided.

described in Section 5.2.1.3.3, Uranium Accumulation and Moderation Assumption. A uniform aqueous solution of UO_2F_2, and a fixed enrichment are conservatively modeled using MONK 8A ~~(SA, 2001)~~ and the JEF2.2 library. Criticality analyses were performed to determine the maximum value of a parameter to yield $k_{eff} = 1$. The criticality analyses were then repeated to determine the maximum value of the parameter to yield a $k_{eff} = 0.95$. Table 5.1-1, Safe Values for Uniform Aqueous Solution of Enriched UO_2F_2, shows both the critical and safe limits for 5.0 $^{w}/_{o}$ and 6.0 $^{w}/_{o}$.

LBDCR-11-0017

Table 5.1-2, Safety Criteria for Buildings/ Systems/Components, lists the safety criteria of Table 5.1-1, Safe Values for Uniform Aqueous Solutions of Enriched UO_2F_2, which are used as control parameters to prevent a nuclear criticality event. Although the NEF will be limited to 5.0 $^{w}/_{o}$ enrichment, as additional conservatism, the values in Table 5.1-2, Safety Criteria for Buildings/Systems/ Components, represent the limits based on 6.0 $^{w}/_{o}$ enrichment except for the Contingency Dump System equipment and piping on the 2nd floor of the Process Services Area and the Tails Take-off System which are limited to 1.5 $^{w}/_{o}$ ^{235}U.

The values on Table 5.1-1 are chosen to be critically safe when optimum light water moderation exists and reflection is considered within isolated systems. The conservative modeling techniques provide for more conservative values than provided in ANSI/ANS-8.1. The product cylinders are only safe under conditions of limited moderation and enrichment. In such cases, both design and operating procedures are used to assure that these limits are not exceeded.

All Separation Plant components, which handle enriched UF_6, other than the Type 30B cylinders and the first stage UF_6 pumps and contingency dump chemical traps, are safe by geometry. Centrifuge array criticality is precluded by a probability argument with multiple operational procedure barriers. Total moderator or H/U ratio control as appropriate precludes product cylinder criticality.

In the Cylinder Receipt and Dispatch Building criticality safety for uranium loaded liquids is ensured by limiting the mass of uranium in any single tank to less than or equal to 12.2 kg U (26.9 lb U). Individual liquid storage bottles are safe by volume. Interaction in storage arrays is accounted for.

Based on the criticality analyses, the control parameters applied to NEF are as follows:

Enrichment

Enrichment is controlled to limit the percent ^{235}U within any process vessel or container to a maximum of the LES license limit~~5%~~ except for the systems and components associated with a cascade dump. For added conservatism the systems controlled to the LES license limit in isotope ^{235}U~~5%~~ are analyzed at 6%.
Assuming a product enrichment of 6% limits the upper bound for the average cascade enrichment to less than 1.5%, the systems and components associated with a cascade dump (Tails Take-off System, Contingency Sump System) are conservatively analyzed at 1.5%

LBDCR-11-0030

Geometry/Volume

Geometry/volume control may be used to ensure criticality safety within specific process operations or vessels, and within storage containers.

3.6 Chapter 3 Tables

Table 3.4-1 Administrative Control IROFS Support Equipment

IROFS	Monitoring Support Equipment	Other Equipment	Equipment Attributes	Operated Support Equipment	Other Equipment	Equipment Attributes
IROFS14a	None	Two independent instruments for determining gross ^{235}U content	Accurate and reliable indication	None	None	None
IROFS14b	None	Two independent instruments for determining gross ^{235}U content	Accurate and reliable indication	None	None	None
IROFS16a	None	Instrument for viewing cylinder internal	None	None	None	None
	None ***(Note 1)**	M&TE Instrument ***(Note 1)**	Accurate and reliable indication	None	None	None
	Pressure instrument ***(Note 2)**	None	Accurate and reliable indication	None	None	None
IROFS30a	None	None	None	None	None	None
IROFS30b	None	Oil analyzer	Accurate and reliable indication	None	None	None
IROFS30c	None	Oil analyzer	Accurate and reliable indication	None	None	None
IROFS31a	None	Instrument for determining gross ^{235}U content, independent of IROFS31b	Accurate and reliable indication	None	None	None
IROFS31b	None	Instrument for determining gross ^{235}U content, independent of IROFS31a	Accurate and reliable indication	None	None	None
IROFS31c	None	None	None	None	None	None
IROFS36c	None	Fuel Tank	Fuel Tank Volume	None	None	None
IROFS36e	None	Fuel Tank	Fuel Tank Volume	None	None	None
	None	UBC Storage Pad Slope	Slope of the Pad to prevent excess pooling	None	None	None
IROFS36f	None	~~None~~Topographical survey equipment	~~None~~Accurate and reliable topography	None	None	None

3.6 Chapter 3 Tables

Table 3.4-1 Administrative Control IROFS Support Equipment

IROFS	Monitoring Support Equipment	Other Equipment	Equipment Attributes	Operated Support Equipment	Other Equipment	Equipment Attributes
			reading			
IROFS36g	None	None	None	None	Landscape Equipment	None
IROFS38	Weighing Scale System including local digital readout from weighing system at the cylinder stations ***(Notes 2 and 3)**	None	Accurate and reliable indication	Select independent isolation valves ***(Note2)**	None	Valve closure
IROFS39a	None	None	None	None	None	None
IROFS39b	None	None	None	None	None	None
IROFS39c	None	None	None	None	None	None
IROFS39d	None	None	None	None	None	None
IROFS42	Product Station Weighing Scale System including local digital readout from weighing system at the product stations ***(Notes 2 and 3)**	None	Accurate and reliable indication	None	None	None
IROFS50a	None	None	None	None	Barriers	Visible and substantial
IROFS50b	None	None	None	None	Barriers	Visible and substantial
IROFS50c	None	None	None	None	Barriers	Visible and substantial
IROFS50d	None	None	None	None	Barriers	Visible
IROFS50e	None	None	None	None	None	None
IROFS50f	None	None	None	None	Barriers	Visible and substantial
IROFS50g	None	None	None	None	Barriers	Visible
IROFS50h	None	None	None	None	Barriers	Visible and substantial
IROFSC22	1) Weigh Scale System including local digital readout from weighing system at cylinder station ***(Notes 2 and 3)**	None	1) Accurate and reliable indication	Select independent isolation valves ***(Note 2)**	None	Valve closure
	2) vent system cold trap load cells ***(Notes 2 and 3)**		2) Accurate and reliable indication			

***(Note 1)** M&TE will be used for Initial Plant Operations until the in-line process instrumentation is installed. The M&TE is QA Level 3 equipment calibrated in accordance with the Maintenance Management Measure. The permanently installed pressure instrument will meet the requirements for QA Level 2AC.

4.1 Commitment to Radiation Protection Program Implementation

The facility corrective action process is implemented if (1) personnel dose monitoring results exceed the administrative personnel limits; or if an incident results in airborne occupational exposures exceeding the administrative limits or (2) the dose limits in 10 CFR 20 (CFR, 2003b), Appendix B or 10 CFR 70.61 (CFR, 2003e) are exceeded.

The information developed from the corrective action process is used to improve radiation protection practices and to preclude the recurrence of similar incidents. If an incident as described in item two above occurs, the NRC is informed of the corrective action taken or planned to prevent recurrence and the schedule established by the facility to achieve full compliance. The corrective action process and incident investigation process are described in Section 11.6, Incident Investigations and Corrective Action Process.

4.1.1 Responsibilities of Key Program Personnel

This section describes the Radiation Protection Program's organizational structure and the responsibilities of key personnel are discussed. These personnel play an important role in the protection of workers, the environment and implementation of the ALARA program. Chapter 2, Organization and Administration, discusses the facility organization and administration in further detail. Section 2.2, Key Management Positions of Chapter 2, presents a detailed discussion of the responsibilities of key management personnel.

4.1.1.1 Plant Manager

The Plant Manager is responsible for all aspects of facility operation, including the protection of all persons against radiation exposure resulting from facility operations and materials, and for compliance with applicable NRC regulations and the facility license.

4.1.1.2 Chemistry Services Manager

The Chemistry Services Manager reports to the Operations Director and has the responsibility for directing the activities that ensure the facility maintains compliance with appropriate rules, regulations, and codes. The compliance responsibilities are activities associated with nuclear safety and monitoring radioactive effluents. .

4.1.1.3 Environmental Compliance Officer

The Environmental Compliance Officer reports to the Health, Safety, and Environmental Manger and has the responsibility for coordination facility activities to ensure all local, state and federal environmental regulations are met.

4.1.1.4 Radiation Protection Manager

The Radiation Protection Manager reports to the ~~Plant Support~~ Director of Compliance and is responsible for implementing the Radiation Protection Program. In matters involving radiological protection, the Radiation Protection Manager has direct access to the Plant Manager. | LBDCR-11-0031

The Radiation Protection Manager is responsible for:

- Establishing the Radiation Protection Program

4.3 Organization and Personnel Qualifications

The regulation 10 CFR 70.22 (CFR, 2003h) requires that the technical qualifications, including training and experience of facility staff be provided in the license application. This information is provided in this section.

The Radiation Protection Program staff is assigned responsibility for implementation of the Radiation Protection Program functions. Only suitably trained radiation protection personnel are employed at the facility. Staffing is consistent with the guidance provided in Regulatory Guides 8.2 and 8.10.

The Radiation Protection Manager's qualification requirements are described in Section 2.2.4. As stated in Section 4.1.2, Staffing of the Radiation Protection Program, other members of the Radiation Protection Program staff are trained and qualified consistent with the guidance provided in American National Standards Institute (ANSI) standard 3.1, Selection, Qualification and Training of Personnel for Nuclear Power Plants.

The Radiation Protection Manager reports to the ~~Plant Support Director~~Director of Compliance and has the responsibility for establishing and implementing the Radiation Protection Program. Duties include training of personnel in use of equipment, control of radiation exposure of personnel, continuous determination and evaluation of the radiological status of the facility. The radiological environmental monitoring program is a function of the Environmental Compliance Officer. The facility organization chart establishes clear organizational relationships among the radiation protection staff and the other facility line managers. The facility operating organization is described in Chapter 2, Organization and Administration. LBDCR-11-0031

In all matters involving radiological protection, the Radiation Protection Manager has direct access to the Plant Manager. The Radiation Protection Manager is skilled in the interpretation of radiation protection data and regulations. The Radiation Protection Manager is also familiar with the operation of the facility and radiation protection concerns relevant to the facility. The Radiation Protection Manager is a resource for radiation safety management decisions.

enclosed stairwells, or are arranged such that flooding from these sources is highly unlikely. Therefore, full water reflection of vessels has therefore been discounted. However, some select analyses have been performed using full reflection for conservatism. Partial reflection of

2.5 cm (0.984 in) of water is assumed where limited moderating materials (including humans) may be present It is recognized that concrete can be a more efficient reflector than water; therefore, it is modeled in analyses where it is present. When moderation control is identified in the ISA Summary, it is established consistent with the guidelines of ANSI/ANS-8.22.

Interaction

Nuclear criticality safety evaluations and analyses consider the potential effects of interaction. A non-interacting unit is defined as a unit that is spaced an approved distance from other units such that the multiplication of the subject unit is not increased. Units may be considered non-interacting when they are separated by more than 60 cm (23.6 inches).

If a unit is considered interacting, nuclear criticality safety analyses are performed. Individual unit multiplication and array interaction are evaluated using the Monte Carlo computer code MONK_8A to ensure k_{eff} = kcalc + 3 σcalc < 0.95.

LBDCR-11-0017

Neutron Absorbers

Neutron Absorption is a factor in almost all of the materials at the NEF. The normal absorption of neutrons in standard materials used in the construction and processes at the NEF (uranium, fluorine, water, steel, etc.) is not specifically excluded as a criticality control parameter.

Models incorporate conservative values (e.g., material compositions and equipment dimensions), which are validated at receipt, after installation or during surveillances.

Additional materials such as cadmium and boron for which the sole purpose would be to absorb neutrons are not incorporated in NEF processes. Solutions of absorbers are not used as a criticality control mechanism.

Concentration and Density

NEF does not use either concentration or density as a criticality control parameter.

5.1.3 Safe Margins against Criticality

Process operations require establishment of criticality safety limits. The facility UF_6 systems involve mostly gaseous operations. These operations are carried out under reduced atmospheric conditions (vacuum) or at slightly elevated pressures not exceeding three atmospheres. It is highly unlikely that any size changes of process piping, cylinders, cold traps, or chemical traps under these conditions, would lead to a criticality situation because a volume or mass limit may be exceeded.

Within the Separations Building Modules, significant accumulations of enriched UF_6 reside only in the Product Low Temperature Take-off Stations, Product Liquid Sampling Autoclaves, Product Blending System or the UF_6 cold traps. All these, except the UF_6 cold traps (which are safe-by-design), contain the UF_6 in 30B cylinders. All these significant accumulations are within enclosures protecting them from water ingress. The facility design has minimized the possibility of accidental moderation by eliminating direct water contact with these cylinders of accumulated UF_6. In addition, the facility's stringent procedural controls for enriching UF_6 assure that it does not become unacceptably hydrogen moderated while in process. The plant's UF_6 systems operating procedures contain safeguards against loss of moderation control (ANSI/ANS 8.22). No neutron poisons are relied upon to assure criticality safety.

5.1.4 Description of Safety Criteria

Each portion of the plant, system, or component that may possibly contain enriched uranium is designed with criticality safety as an objective. Table 5.1-2, Safety Criteria for Buildings/ Systems/Components, shows how the safety criteria of Table 5.1-1, Safe Values for Uniform Aqueous Solutions of Enriched UO_2F_2, are applied to the facility to prevent a nuclear criticality event. Although the NEF will be limited to Material License Condition 6B for~~5.0~~ $^{w}/_{o}$ enrichment, as additional conservatism, the values in Table 5.1-2, represent the limits based on 6.0 $^{w}/_{o}$ enrichment with the exception of the Tails Take-off and Contingency Dump Systems. These systems are limited to the maximum process system average enrichment, 1.5%. LBDCR-11-0030

Where there are significant in-process accumulations of enriched uranium as UF_6, the plant design includes multiple features to minimize the possibilities for breakdown of the moderation control limits. These features eliminate direct ingress of water to product cylinders while in process.

5.1.5 Organization and Administration

The criticality safety organization is responsible for implementing the Nuclear Criticality Safety Program.

The Criticality Safety Officer reports to the Health, Safety, and Environmental Manager as described in Chapter 2, Organization and Administration. The Health, Safety, and Environmental Manager is accountable for overall criticality safety of the facility, is administratively independent of production responsibilities, and has the authority to shut down potentially unsafe operations.

Designated responsibilities of the Criticality Safety Officer include the following:

- Establish the Nuclear Criticality Safety Program, including design criteria, procedures, and training
- Assess normal and credible abnormal conditions
- Determine criticality safety limits for controlled parameters, with input from the Criticality Safety Engineers
- Develop and validate methods to support nuclear criticality safety evaluations (NCSEs) (i.e., non-calculation engineering judgments regarding whether existing criticality safety analyses bound the issue being evaluated or whether new or revised safety analyses are required)
- Specify criticality safety control requirements and functionality
- Provide advice and counsel on criticality safety control measures
- Support emergency response planning and events
- Evaluate the effectiveness of the Nuclear Criticality Safety Program using audits and assessments

- Provide criticality safety postings that identify administrative controls for operators in applicable work areas.

Criticality Safety Engineers will be provided in sufficient number to support the program technically. They are responsible for the following:

- Provide criticality safety support for integrated safety analyses and configuration control
- Perform NCS analyses (i.e., calculations), write NCS evaluations, and approve proposed changes in process conditions on equipment involving fissionable material

Qualified Criticality Safety Engineers may also perform tasks associated with Criticality Safety program implementation and assessment.

The minimum qualifications for the Criticality Safety Officer and the Criticality Safety Engineer are described in Section 2.2.4. The Criticality Safety Engineer training program is based on ANSI/ANS-8.26, Criticality Safety Engineer Training and Qualification Program. The Health and Safety Manager has the authority and responsibility to assign and direct activities for the Criticality Safety Program. The Criticality Safety Officer is responsible for implementation of the NCS program. LBDCR-11-0019

The NEF implements the intent of the administrative practices for criticality safety, as contained in Section 4.1.1 of American National Standards Institute/American Nuclear Society (ANSI/ANS)-8.1, Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors. A policy will be established whereby personnel shall report defective NCS conditions and perform actions only in accordance with written, approved procedures. Unless a specific procedure deals with the situation, personnel shall report defective NCS conditions and take no action until the situation has been evaluated and recovery procedures provided.

5.2 Methodologies and Technical Practices

This section describes the methodologies and technical practices used to perform the Nuclear Criticality Safety (NCS) analyses and NCS evaluations. The determination of the NCS controlled parameters and their application and the determination of the NCS limits on IROFS are also presented.

5.2.1 Methodology

MONK_8A ~~(SA, 2001)~~ is a powerful Monte Carlo tool for nuclear criticality safety analysis. The LBDCR-11-0017 advanced geometry modeling capability and detailed continuous energy collision modeling treatments provide realistic 3-dimensional models for an accurate simulation of neutronic behavior to provide the best estimate neutron multiplication factor, k-effective. Complex models can be simply set up and verified. Additionally, MONK_8A ~~(SA, 2001)~~ has demonstrable LBDCR-11-0017 accuracy over a wide range of applications and is distributed with a validation database comprising critical experiments covering uranium, plutonium and mixed systems over a wide range of moderation and reflection. The experiments selected are regarded as being representative of systems that are widely encountered in the nuclear industry, particularly with respect to chemical plant operations, transportation and storage. The validation database is subject to on-going review and enhancement. A categorization option is available in MONK_8A ~~(SA, 2001)~~ to assist the criticality analyst in determining the type of system being assessed and LBDCR-11-0017 provides a quick check that a calculation is adequately covered by validation cases.

5.2.1.1 Methods Validation

The validation process establishes method bias by comparing measured results from laboratory critical experiments to method-calculated results for the same systems. The verification and validation processes are controlled and documented. The validation establishes a method bias by correlating the results of critical experiments with results calculated for the same systems by the method being validated. Critical experiments are selected to be representative of the systems to be evaluated in specific design applications. The range of experimental conditions encompassed by a selected set of benchmark experiments establishes the area of applicability over which the calculated method bias is applicable. Benchmark experiments are selected that resemble as closely as practical the systems being evaluated in the design application.

The extensive validation database contains a number of experiments applicable to this application involving low and intermediate-enriched uranium. The MONK_8A ~~(SA, 2001)~~ code LBDCR-11-0017 with the JEF2.2 library was validated against these experiments which are provided in the International Handbook of Evaluated Criticality Safety Benchmark Experiments (NEA, 2002) and NUREG/CR-1071. The experiments chosen are provided in Table 5.2-1, Uranium Experiments Used for Validation, along with a brief description. The overall mean calculated value from these 93 configurations is 1.0017 ± 0.0045 and the results are provided in the MONK_8A Validation and Verification report ~~(see AREVA in ISAS table 3.0-1)~~. LBDCR-11-0017

MONK_8A is distributed in ready-to-run executable form. This approach provides the user with a level of quality assurance consistent with the needs of safety analysis. The traceability from source code to executable code is maintained by the code vendor.

5.2 Methodologies and Technical Practices

In accordance with the guidance in NUREG-1520, code validation for the specific application has been performed ~~(see AREVA in ISAS table 3.0-1)~~. Specifically, the experiments provided in Table 5.2-1, Uranium Experiments Used for Validation, were calculated and documented in the MONK_8A Validation and Verification report ~~(see AREVA in ISAS table 3.0-1)~~ for the National Enrichment Facility. In addition, the MONK_8A Validation and Verification report ~~(see AREVA in ISAS table 3.0-1)~~ satisfies the commitment to ANSI/ANS-8.1 and includes details of computer codes used, operations, recipes for choosing code options (where applicable), cross sections sets, and any numerical parameters necessary to describe the input. Any revision to the validation of neutron transport methods will be performed using ANSI/ANS-8.24, Validation of Neutron Transport Methods for Nuclear Criticality Safety Calculations as a guideline with exception as identified in Regulatory Guide 3.71, Nuclear Criticality Safety Standards for Fuels and Material Facilities (Revision 2.2010). The two exceptions pertain to the use of a positive bias and rejection of outliers.

LBDCR-11-0017

LBDCR-11-0017

LBDCR-11-0017

LBDCR-11-0019

The MONK_8A computer code and JEF2.2 library are within the scope of the Quality Assurance Program.

5.2.1.2 Limits on Control and Controlled Parameters

The validation process established a bias by comparing calculations to measured critical experiments. With the bias determined, an upper safety limit (USL) can be determined using the following equation from NUREG/CR-6698, Guide for Validation of Nuclear Criticality Safety Calculational Methodology:

$$USL = 1.0 + Bias - \sigma_{Bias} - \Delta_{SM} - \Delta_{AOA}$$

Where the critical experiments are assumed to have a k_{eff} of unity, and the bias was determined by comparison of calculation to experiment. From Section 5.2.1.1, Methods Validation, the bias is positive and since a positive bias may be non-conservative, the bias is set to zero. The σBias from the MONK_8A Validation and Verification ~~(see AREVA in ISAS table 3.0-1)~~ is 0.0085 and a value of 0.05 is assigned to the subcritical margin, ΔSM. The term ΔAOA is an additional subcritical margin to account for extensions in the area of applicability. Since the experiments in the benchmark are representative of the application, the term ΔAOA is set to zero for systems and components not associated with the Contingency Dump System. For the Contingency Dump System, it was necessary to extrapolate the area of applicability to include 1.5% enrichment and the term ΔAOA is set to 0.0014 to account for this extrapolation. Thus, the USL becomes:

LBDCR-11-0017

- USL = 1 + 0 – 0.0085 – 0.05 = 0.9415 (for systems and components NOT associated with the Contingency Dump System)
- USL = 1 + 0 – 0.0085 – 0.05 – 0.0014 = 0.9401 (for the Contingency Dump System and Tails Take-off System)

NUREG/CR-6698 indicates that the following condition be demonstrated for all normal and credible abnormal operating conditions:

$$k_{calc} + 2\,\sigma_{calc} < USL$$

The risk of an accidental criticality resulting from NEF operations is inherently low. The low risk warrants the use of an alternate approach.

At the low enrichment limits established for the NEF, sufficient mass of enriched uranic material cannot be accumulated to achieve criticality without moderation. Uranium in the centrifuge plant is inherently a very dry, unmoderated material. Centrifuge separation operations at NEF do not include solutions of enriched uranium. For most components that form part of the centrifuge plant or are connected to it, sufficient mass of moderated uranium can only accumulate by reaction between UF_6 and moisture in air leaking into plant process systems, leading to the accumulation of uranic breakdown material. Due to the high vacuum requirements for the normal operation of the facility, air inleakage into the process systems is controlled to very low levels and thus the highly moderated condition assumed represents an abnormal condition. In addition, excessive air in-leakage would result in a loss of vacuum, which in turn would cause the affected centrifuges to crash (self destruct) and the enrichment process in the affected centrifuges to stop. As such, buildup of additional mass of moderated uranic breakdown material, such that component becomes filled with sufficient mass of enriched uranic material for criticality, is precluded. Even when accumulated in large UF_6 cylinders or cold traps, neither UF_6 nor UO_2F_2 can achieve criticality without moderation at the low enrichment limit established for the NEF.

Therefore, due to the low risk of accidental criticality associated with NEF operations and the margin that exists in the design and operation of the NEF with respect to nuclear criticality safety, a margin of subcriticality for safety of 0.05 (i.e., $k_{eff} = k_{calc} + 3\sigma_{calc} < 0.95$) is adequate to ensure subcriticality is maintained under normal and abnormal credible conditions. As such, the NEF will be designed using the equation:

$$k_{eff} = k_{calc} + 3\sigma_{calc} < 0.95$$

5.2.1.3 General Nuclear Criticality Safety Methodology

The NCS analyses results provide values of k-effective (k_{eff}) to conservatively meet the upper safety limit. The following sections provide a description of the major assumptions used in the NCS analyses.

5.2.1.3.1 Reflection Assumption

The layout of the NEF is a very open design and it is not considered credible that those vessels and plant components requiring criticality control could become flooded from a source of water within the plant. Full water reflection of vessels has therefore been discounted. However, where appropriate, spurious reflection due to walls, fixtures, personnel, etc. has been accounted for by assuming 2.5 cm (0.984 in) of water reflection around vessels.

5.2.1.3.2 Enrichment Assumption

Enrichment is controlled to limit the percent ^{235}U within any process vessel or container to the LES license limit~~a maximum of 5%~~ except for the systems and components associated with a cascade dump. For added conservatism the systems controlled to the LES license limit in isotope ^{235}U~~5%~~ are analyzed at 6%.

LBDCR-11-0030

Assuming a product enrichment is 6% limits the upper bound for the average cascade enrichment to less than 1.5% the systems and components associates with a cascade dump (Tails Take-off System. Contingency Dump System) are conservatively analyzed at 1.5%

5.2.1.3.3 Uranium Accumulation and Moderation Assumption

Most components that form part of the centrifuge plant or are connected to it assume that any accumulation of uranium is taken to be in the form of a uranyl fluoride/water mixture at a maximum H/U atomic ratio of 7 (exceptions are discussed in the associated nuclear criticality safety analyses documentation). The ratio is based on the assumption that significant quantities of moderated uranium could only accumulate by reaction between UF_6 and moisture in air leaking into the plant. Due to the high vacuum requirements of a centrifuge plant, in-leakage is controlled at very low levels and thus the H/U ratio of 7 represents an abnormal condition. The maximum H/U ratio of 7 for the uranyl fluoride-water mixture is derived as follows:
The stoichiometric reaction between UF_6 and water vapor in the presence of excess UF_6 can be represented by the equation:

$$UF_6 + 2H_2O \rightarrow UO_2F_2 + 4HF$$

Due to its hygroscopic nature, the resulting uranyl fluoride is likely to form a hydrate compound. Experimental studies (Lychev, 1990) suggest that solid hydrates of compositions UO2F2·1.5H2O and UO2F2·2H2O can form in the presence of water vapor, the former composition being the stable form on exposure to atmosphere.

It is assumed that the hydrate $UO_2F_2 \cdot 1.5H_2O$ is formed and, additionally, that the HF produced by the UF_6/water vapor reaction is also retained in the uranic breakdown to give an overall reaction represented by:

$$UF_6 + 3.5H_2O \rightarrow UO_2F_2 \cdot 4HF \cdot 1.5H_2O$$

For the MONK_8A ~~(SA, 2001)~~ calculations, the composition of the breakdown product was simplified to $UO_2F_2 \cdot 3.5H_2O$ that gives the same H/U ratio of 7 as above.

LBDCR-11-0017

In the case of oils, UF_6 pumps and vacuum pumps use a fully fluorinated perfluorinated polyether (PFPE) type lubricant. Mixtures of UF_6 and PFPE oil would be a less conservative case than a uranyl fluoride/water mixture, since the maximum HF solubility in PFPE is only about 0.1 $^{w}/_{o}$. Therefore, the uranyl fluoride/water mixture assumption provides additional conservatism in this case.

5.2.1.3.4 Vessel Movement Assumption

The limits placed on movement of an individual vessel or a specified batch of vessels containing enriched uranium are specified in the facility procedures or work plans, both of which are reviewed by Nuclear Criticality Safety. Specified limits may not be required based on bounding or process/system-specific NCS evaluations or analysis.

Of the subset of individual vessels or groups of vessels that do not have specified controls but are bounded by a the single-parameter SBD limits in Table 5.1-1, separation must be maintained at least 60 cm (23.6 in) from any other enriched uranium.

Vessels or groups of vessels that do not comply with either of the statements above must not be moved without the written approval of the Criticality Safety Officer.

5.2.1.3.5 Pump Free Volume Assumption

There are two types of pumps used in product and dump systems of the plant:

- The vacuum pumps (product and dump) are rotary vane pumps. In the enrichment plant fixed equipment, these are assumed to have a free volume of 14 L (3.7 gal) and are modeled as a cylinder in MONK_8A ~~(SA, 2001)~~. This adequately covers all models likely to be purchased. | LBDCR-11-0017
- The UF_6 pumping units are a combination unit of two pumps, one 500 m^3/hr (17,656 ft^3/hr) pump with a free volume of 8.52 L (2.25 gal) modeled as a cylinder, and a larger 2000 m^3/hr (70,626 ft^3/hr) pump which is modeled explicitly according to manufacturer's drawings.

5.2.1.4 Nuclear Criticality Safety Analyses

Nuclear criticality safety is analyzed for the design features of the plant system or component and for the operating practices that relate to maintaining criticality safety. The analysis of individual systems or components and their interaction with other systems or components containing enriched uranium is performed to assure the criticality safety criteria are met. The nuclear criticality safety analyses and the safe values in Table 5.1-1, Safe Values for Uniform Aqueous Solution of Enriched UO_2F_2, provide a basis for the plant design and criticality hazards identification performed as part of the Integrated Safety Analysis.

Each portion of the plant, system, or component that may possibly contain enriched uranium is designed with criticality safety as an objective. Table 5.1-2, Safety Criteria for Buildings/Systems/Components, shows how the safe values of Table 5.1-1, are applied to the facility design to prevent a nuclear criticality event. The NEF is designed and operated in accordance with the parameters provided in Table 5.1-2. The Integrated Safety Analysis reviewed the facility design and operation and identified Items Relied On For Safety to ensure that criticality does not pose an unacceptable risk.

Where there are significant in-process accumulations of enriched uranium as UF_6 the plant design includes multiple features to minimize the possibilities for breakdown of the moderation control limits. These features eliminate direct ingress of water to product cylinders while in process.

Each NCS analysis includes, as a minimum, the following information.

- A discussion of the scope of the analysis and a description of the system(s)/process(es) being analyzed.
- A discussion of the methodology used in the criticality calculations, which includes the validated computer codes and cross section library used and the k_{eff} limit used (0.95).
- A discussion of assumptions (e.g. reflection, enrichment, uranium accumulation, moderation, movement of vessels, component dimensions) and the details concerning the assumptions applicable to the analysis.
- A discussion on the system(s)/process(es) analyzed and the analysis performed, including a description of the accident or abnormal conditions assumed.
- A discussion of the analysis results, including identification of required limits and controls.

During the design, construction and operations phases of NEF, the NCS analysis is performed by a criticality safety engineer and independently reviewed by a second criticality safety engineer. During the operation of NEF, the NCS analysis is performed by a criticality safety engineer, independently reviewed by a second criticality safety engineer and approved by the Engineering Manger or the Criticality Safety Engineering Supervisor. Only qualified criticality safety engineers can perform NCS analyses and associated independent review.

5.2.1.5 Additional Nuclear Criticality Safety Analyses Commitments

The NEF NCS analyses were performed using the above methodologies and assumptions. NCS analyses also meet the following:

- NCS analyses are performed using acceptable methodologies.
- Methods are validated and used only within demonstrated acceptable ranges.
- The analyses adhere to ANSI/ANS-8.1 as it relates to methodologies.
- The validation report statement in Regulatory Guide 3.71, Nuclear Criticality Safety Standards for Fuels and Material Facilities, is as follows: LES has demonstrated (1) the adequacy of the margin of safety for subcriticality by assuring that the margin is large compared to the uncertainty in the calculated value of k_{eff}, (2) that the calculation of k_{eff} is based on a set of variables whose values lie in a range for which the methodology used to determine k_{eff} has been validated, and (3) that trends in the bias support the extension of the methodology to areas outside the area or areas of applicability. LBDCR-11-0019
- A specific reference to (including the date and revision number) and summary description of either a manual or a documented, reviewed, and approved validation report for each methodology are included. Any change in the reference manual or validation report will be reported to the NRC by letter.
- The reference manual and documented reviewed validation report will be kept at the facility.
- The reference manual and validation report are incorporated into the configuration management program.
- The NCS analyses are performed in accordance with the methods specified and incorporated in the configuration management program.
- The NCS methodologies and technical practices in NUREG-1520, Section 5.4.3.4, are used to analyze NCS accident sequences in operations and processes.
- The acceptance criteria in NUREG-1520, Section 3.4, as they relate to: identification of NCS accident sequences, consequences of NCS accident sequences, likelihood of NCS accident sequences, and descriptions of IROFS for NCS accident sequences are met.
- NCS controls and controlled parameters to assure that under normal and credible abnormal conditions, all nuclear processes are subcritical, including use of an approved margin of subcriticality for safety are used.
- As stated in ANSI/ANS-8.1, process specifications incorporate margins to protect against uncertainties in process variables and against a limit being accidentally exceeded.
- ANSI/ANS-8.7, as it relates to the requirements for subcriticality of operations, the margin of subcriticality for safety, and the selection of controls required by 10 CFR 70.61(d) (CFR, 2003b), is used.

- ANSI/ANS-8.10, as modified by Regulatory Guide 3.71, Nuclear Criticality Safety Standards for Fuel and Material Facilities, as it relates to the determination of consequences of NCS accident sequences, is used. LBDCR-11-0019
- If administrative k_{eff} margins for normal and credible abnormal conditions are used, NRC pre-approval of the administrative margins will be sought.
- Subcritical limits for k_{eff} calculations such that: k_{eff} subcritical = 1.0 - bias - margin, where the margin includes adequate allowance for uncertainty in the methodology, data, and bias to assure subcriticality are used.
- Studies to correlate the change in a value of a controlled parameter and its k_{eff} value are performed. The studies include changing the value of one controlled parameter and determining its effect on another controlled parameter and k_{eff}.
- The double contingency principle is met. The double contingency principle is used in determining NCS controls and IROFS.
- The acceptance criteria in NUREG-1520 Section 3.4, as they relate to subcriticality of operations and margin of subcriticality for safety, are met.

5.2.1.6 Nuclear Criticality Safety Evaluations (NCSE)

For any change (i.e., new design or operation, or modification to the facility or to activities of personnel, e.g., site structures, systems, components, computer programs, processes, operating procedures, management measures), that involves or could affect uranium, a NCSE shall be prepared and approved. Prior to implementing the change, it shall be determined that the entire process will be subcritical (with approved margin for safety) under both normal and credible abnormal conditions. If this condition cannot be shown with the NCSE, either a new or revised NCS analysis will be generated that meets the criteria, or the change will not be made.

The NCSE shall determine and explicitly identify the controlled parameters and associated limits upon which NCS depends, assuring that no single inadvertent departure from a procedure could cause an inadvertent nuclear criticality and that the safety basis of the facility will be maintained during the lifetime of the facility. The evaluation ensures that all potentially affected uranic processes are evaluated to determine the effect of the change on the safety basis of the process, including the effect on bounding process assumptions, on the reliability and availability of NCS controls, and on the NCS of connected processes.

The NCSE process involves a review of the proposed change, discussions with the subject matter experts to determine the processes which need to be considered, development of the controls necessary to meet the double contingency principle, and identification of the assumptions and equipment (e.g., physical controls and/or management measures) needed to ensure criticality safety.

Engineering judgment of the criticality safety engineer is used to ascertain the criticality impact of the proposed change. The basis for this judgment is documented with sufficient detail in the NCSE to allow the independent review by a second criticality safety engineer to confirm the conclusions of the judgment of results. Each NCSE includes, as a minimum, the following information.

- A discussion of the scope of the evaluation, a description of the system(s)/process(es) being evaluated, and identification of the applicable nuclear criticality safety analysis

5.5 References

Edition of Codes, Standards, NRC Documents, etc., that are not listed below are given in ISAS Table 3.0-1. LBDCR-11-0019

CFR, 2003a. Title 10, Code of Federal Regulations, Part 70, Domestic Licensing of Special Nuclear Material, 2003.

CFR, 2003b. Title 10, Code of Federal Regulations, Section 70.61, Performance requirements, 2003.

CFR, 2003c. Title 10, Code of Federal Regulations, Section 70.64, Requirements for new facilities or new processes at existing facilities, 2003.

CFR, 2003d. Title 10, Code of Federal Regulations, Section 70.24, Criticality accident requirements, 2003.

CFR, 2003e. Title 10, Code of Federal Regulations, Section 70.72, Facility changes and change process, 2003.

CFR, 2003f. Title 10, Code of Federal Regulations, Part 70, Appendix A, Reportable Safety Events, 2003.

CFR, 2003g. Title 10, Code of Federal Regulations, Section 70.50, Reporting requirements, 2003.

Lychev, 1990. Crystalline Hydrates of Uranyl Fluoride at 20°C, Lychev, Mikhalev and Suglobov. Journal of Soviet Radiochemistry, Vol 32, 1990.

NEA, 2002. International Handbook of Evaluated Criticality Safety Benchmark Experiments, NEA/NSC/DOC(95)03, Nuclear Energy Agency, September 2002 Edition.

SA, 2001. Serco Assurance, ANSWERS Software Service, “Users Guide for Version 8 ANSWERS/MONK(98) 6,” 1987-2001.